MARCH 1950

# Plant Engineering

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Volume 4, No. 3 Circulation of this issue 28,251

The magazine that helps plant engineers with their everyday problems

# Why P&H *Job-Engineered* Cranes mean better service for you

When you buy a P&H Overhead Crane, you buy proved performance. Your crane will be *engineered* to meet the requirements of your specific job — coordinated with P&H electrical equipment, designed . . . not adapted . . . for crane service. There will be ample reserve capacity, adequate service life, maximum safety and every modern operating advantage. All these combine to give you long years of crane service with the least trouble and maintenance cost.

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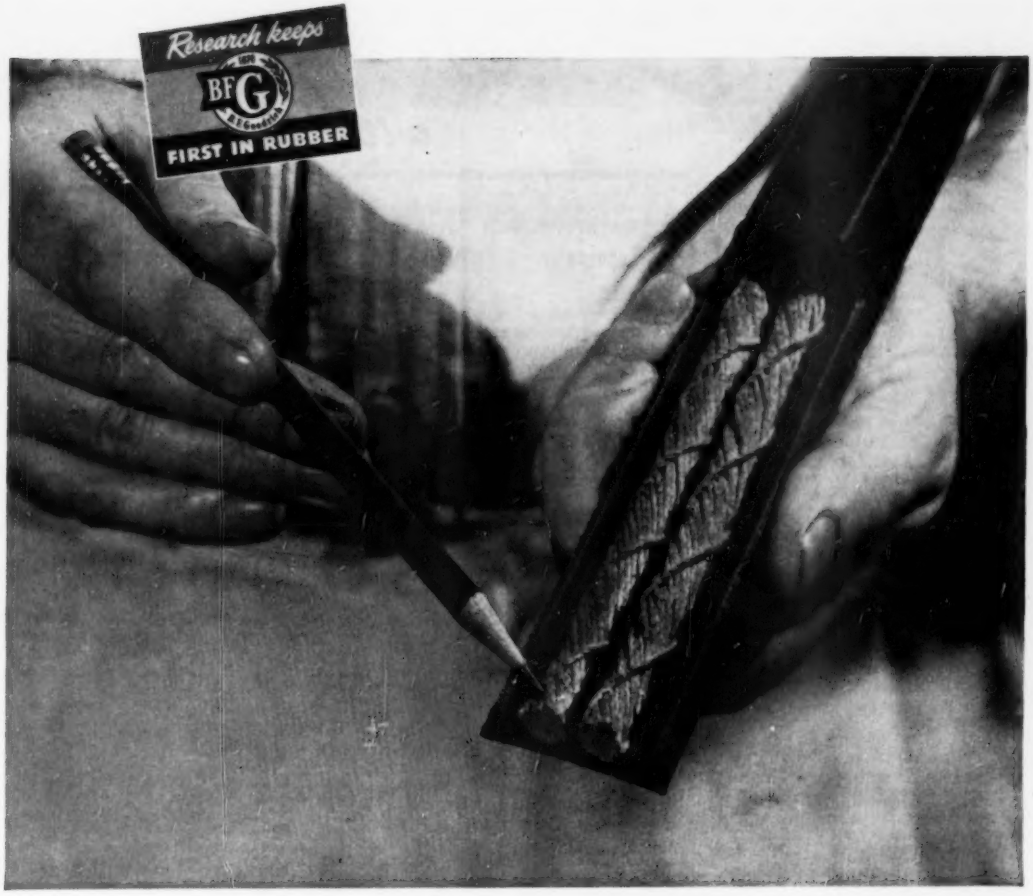


# How twin grommets reduce belt failures

## *B.F.Goodrich grommet V belts last 20 to 50% longer*

WHEN an ordinary V belt enters the sheave, the center cords are forced down and away from the center where the load is carried. Belt men call this "dishing" because the cord section becomes concave like a dish. With the new B. F. Goodrich V belt there are no center cords, no "dishing." Here's how it works —

***All cords are put to work*** — Twin grommets are placed close to the driving faces of the belt. All the time the belt is in the pulley, the grommets keep working close to the driving surfaces. The load is evenly distributed. In laboratory tests, grommet V belts actually lasted 20 to 50% longer.

***Every part is flexible*** — Because a grommet V belt has no stiff overlapping section, every part is equally flexible. Better grip, less slip. Grommet V belts give ⅓ more gripping power, pull heavier loads with a higher safety factor.

***Endless grommets reduce belt failures*** — Most of the failures in ordinary belts occur where cords overlap. But in the B. F. Goodrich grommet V belt the cord section is *endless* — made by winding heavy cord on itself to form an endless loop. These are twin cord sections, *not ordinary cables.*

***No other V belt has it*** — Twin grommet construction is found only in B. F. Goodrich V belts. (U. S. Patent No. 2,233,294.) It's a premium construction feature that costs you no more. At present made in D and E sections only. Ask your local B. F. Goodrich distributor to show you his "X-ray" belt that clearly illustrates grommet construction. *The B.F.Goodrich Company, Industrial and General Products Division, Akron, Ohio.*

*Grommet V Belts* BY
**B.F.Goodrich**

**PLANT ENGINEERING**

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# 'Round About with the Editors

## PE Inaugurates Data File Service

STARTING this month on page 65, PLANT ENGINEERING is presenting a new service for its readers. It has long been our contention that some of the best source material published is available from manufacturers' engineering data books, catalogs, handbooks or, in some cases, even pamphlets.

Usually, these will be described but once in any given periodical and then, like the three little sheep in Whiffenpoof, will die and be forgotten. Many of these publications are expensive; others may be held in limited quanties by the respective manufacturers. So, the offer to forward any of them may, possibly, be withdrawn in future issues.

## Tire, Wheel Analysis Plan Offered Plants

A NEW TIRE AND Wheel Analysis Plan in which any company desiring the service can have its wheeled vehicles studied and recommendations made without cost has been announced by the B. F. Goodrich Co., Akron, Ohio.

An experienced tire and wheel engineer will survey the company's materials handling program upon request, studying loads, hauls, handling equipment, floors and building surfaces, and discuss any special tire and wheel problems. On completion of the study recommendations will be submitted on the best type of tires and wheels for each particular service, without any obligation on the part of the company which has sought the analysis. Information on the longest wearing rubber compounds for particular type services, and on retreading of tires will be included, as well as suggestions on tire care and maintenance.

Goodrich authorities in this field believe that tire and wheel costs can be cut as much as 50 per cent through the application of the right type, size and tread compounds, with additional savings through protection of floors, equipment and cargoes. Proper tire maintenance alone can cut tire and wheel costs 10 to 20 per cent, the company says.

Work sheets which are filled out by the tire engineer making the analysis, list the type of vehicles, number of units of each type, power, trailer and hand, wheel load and size, hub length, axle diameter, hub offset, type of bearings, type of tire and wheel and tire size, as well as complete dimensions of the wheel and other information.

## Wheeler, Former P.E., Moves Up

ROY L. WHEELER has been appointed Chief Fuels and Lubricants Engineer, General Machinery Section, Industrial Products Engineering of the Gulf Oil Corp., Pittsburgh, Pa. Following graduation in 1921 from Rensselaer Polytechnic Institute with the degree of M.E., he was instructor in their Department of Mechanical Engineering. Subsequently, he was employed by the Aluminum Company of America for ten years, six years as Plant Engineer of their Niagara Falls and Massena, N. Y., plants, two years as buyer in their Central Purchasing Department, and two years as Staff Mechanical Engineer in their General Engineering Department. He has been associated with the Gulf organization since 1933, serving twelve years as Industrial Lubrication Service Engineer in the Pittsburgh Division.

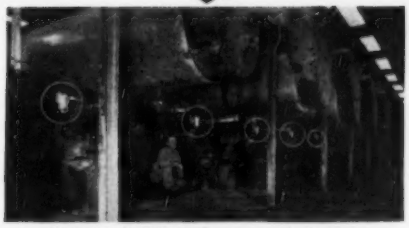
## Controls Raw Stock With Metals Comparator

TO CONTROL raw metal stock, the Chemical Laboratory of the Woodward Governor Co., Rockford, Ill., is now using a Metals Comparator with selective frequency from 50-10,000 cps. Several sizes of coils for high and low frequencies, as well as a special test head, are being used for the testing procedure.

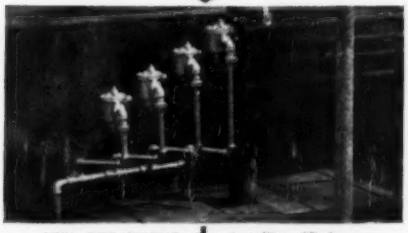
The Metals Comparator developed by the G.E. General Engineering & Consulting Laboratory is being used at present, according to Bert Burridge, chief inspector of the company, to inspect all raw materials in bar form, supplemented by the regular chemical testing procedure, in order to determine the acceptance of material as to type and uniformity of chemical and/or physical properties. Separation of chemically mixed stock or parts, and physically mixed parts are being determined at the laboratory by the use of the comparator. Also selection of material as to machinability and the determination of plating or coating thickness are being inspected with the instrument.

# "This Trap can't leak steam . . ."

## YOU SAVE MONEY



**$300 PER MONTH** fuel saving with 17 Armstrong traps on jacketed kettles and expeller tempering troughs. The traps cost $316. More than 1000% return per year! — *Pacific Nut Oil Co., Los Angeles.*



**20% FUEL SAVING** since installing 57 Armstrong traps on heating coils makes the coal pile last longer at *Norton Greenhouse, St. Paul.* Heating-up time has been cut in half, too.

THERE is never any loss of steam through an Armstrong Trap in proper working order, even when there is no condensate load . . . because steam never reaches the discharge orifice. The valve is water-sealed at all times. Entering steam is trapped in the inverted bucket, which then floats and closes the valve.

RESULT: You save steam, fuel and money, minimize back pressure in your return lines.

Your nearby Armstrong representative will be glad to quote on the traps you need now.

**ARMSTRONG MACHINE WORKS**
**912 MAPLE ST., THREE RIVERS, MICH.**

SEND FOR the Armstrong Steam Trap Book. It describes operation of the Armstrong Steam Trap, contains prices, data, capacity chart, trap selection data for all classes of equipment.

# ARMSTRONG STEAM TRAPS

YOU CAN BE **SURE**.. IF IT'S

# Westinghouse

**MAINTENANCE SERVICE**

Your nearest Westinghouse Manufacturing and Repair Plant—one of a network of 56—is expertly manned and completely equipped for both regular and emergency repairs of all kinds of electrical apparatus.

# FAST

# Electrical Repairs

## ALL OVER THE MAP—AROUND THE CLOCK

No matter where or when you may need fast repair service on your electrical equipment, you can get it from Westinghouse. Our newly-expanded organization makes this an accomplished fact.

Strategically placed at the hubs of all the important industrial areas, Westinghouse Repair and Maintenance facilities are co-ordinated to give you faster service than ever before.

Our Manufacturing and Repair Plant nearest you uses factory-trained personnel and factory methods to do the job the quickest possible way. For your major equipment, our Field Service Engineers diagnose trouble and make speedy repairs in your own plant. In addition, you get prompt shipment of genuine Westinghouse Parts from our local Renewal Parts Warehouse.

If a breakdown occurs, we can and will handle it. We work overtime whenever that is needed. For example, when lightning recently struck a 100-hp, 2,300-volt induction motor vital to the operation of the main water-pumping station in a Southern city, we completely rewound the motor in 2½ days.

Fast Westinghouse Service is available for all classes of customers—including Electric Utility, Transportation, Mining, Industrial, Marine and Aviation. Let us help you in solving your special maintenance problems. Contact your nearest Sales Office or M & R Plant. Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania. J-94821

**All Westinghouse Renewal Parts are manufactured to original specifications—using the latest materials produced by our research facilities—with the care taken in the manufacture of the original equipment.**

**To protect the operation of Westinghouse apparatus and insure fast service, genuine Westinghouse Renewal Parts are stocked in 33 Renewal Parts Warehouses conveniently located throughout the country.**

# Sensational new

# ROXCO

*it's individually*

## REGISTERED

*it's completely*

## GUARANTEED

**TRIMO-ALLOY WRENCH . . .** Roxco's only Rival . . . an all alloy-steel heavy duty pipe wrench long famous for ruggedness. Different in design, but has power comparable to Roxco.

*Prove its superiority for yourself!*

## SPECIAL MONEY-BACK TRIAL OFFER

Buy one "Registered" Roxco and use it for your toughest jobs. If you don't agree it stands up better . . . is handier, faster to use . . . is a bigger value than any pipe wrench you've ever used . . . return *that* one trial Roxco direct to us (not the seller), within sixty days with a note of price paid and reason for returning. We will refund your money. This get-acquainted offer good until Dec. 31, 1950. Trimont Mfg. Co., Roxbury, Mass.

# "Registered" ROXCO . . . First Pipe Wrench Engineered by Stress Analysis to Combine Maximum Strength with Minimum Weight

See dark Hardened area

*Here*, at last, is a pipe wrench that's a brute for strength, yet a beauty to handle.

No longer is there any need to tolerate useless weight in order to get dependable strength. Through stress analysis during design, useless metal that means tiring weight was engineered out of the new *Roxco*. Extra metal, exactly where needed for extra strength, was engineered in.

The lighter, handier, faster-working *Roxco* actually exceeds by a good margin the strength requirements of Federal Spec's. for Heavy Duty Pipe Wrenches, Type II, GGG-W-651a.

In many other ways, too, *Roxco* is the most practical pipe wrench ever known. Read all its superior features . . . the ratcheting action that matches any man's speed . . . the tough jaws with induction hardened teeth . . . the unique reinforcing shoulder behind insert jaw . . . and all the others. Get a trial *Roxco* . . . judge it on the job. It's made in sizes 6" to 48". No gamble because every wrench is . . .

**Individually REGISTERED . . . Completely GUARANTEED**

Special design and quality control enable us to back the *Roxco* to the fullest extent. Every wrench is given its own serial number and fully guaranteed . . . *every* part of it . . . against breakage in any normal heavy duty use.

## ✓ Check these "engineered" features

**1 Extra Strength Based on Stress Analysis:** Extra metal at critical points provides much higher resistance to failure. Withstands unusual stress in "side pull".

**2 Lighter Weight Achieved:** Stress analysis showed where useless metal could be eliminated to produce a lighter, handier wrench.

**3 Uniform Jaw Hardness and Strength:** Both jaws are drop-forged alloy steel. Teeth are hardened by automatically-timed, localized induction process at wear points, yet tough core of jaws is retained for strength.

**4 Reinforcing Shoulder Behind Insert Jaw** resists unusual stress. Assures long, trouble-free service.

**5 Rapid Ratcheting Action:** New, simplified cushion action replaces complicated spring. With Roxco tooth design, it prevents seizure on pipe and permits fast ratcheting — as fast as user can move his hand. Accurate fit of parts saves lost motion—speeds jobs.

**6 Comfort-Shaped, Palm-Fitting Handle:** New wider, more comfortable handle — makes work easier, cuts worker fatigue.

**7 Reinforced Housing** embodies a hammer face to break cast fittings.

**8 Handy, Accurate Pipe Scale** permits quick adjustment to desired size.

**Special Metallurgical Formula:** Roxco Metal, combined with scientific heat treating, means superior strength throughout.

### AMAZING TEST OF STRENGTH

4510 LBS. of automobile and rigging was suspended from the handle of a stock 24" ROXCO gripped on a steel shaft. No distortion when the load was removed—the wrench was 100% perfect throughout!

The JOY AXIVANE® FAN
Mounts Right in the Air Duct—
Saves space, installation costs, gives you quieter, more efficient ventilation!
A JOY Axivane Fan in a commercial store—chosen for its low noise level, compactness, and simple and easy installation.
Write for Bulletins, or
Consult a Joy Engineer
JOY MANUFACTURING COMPANY
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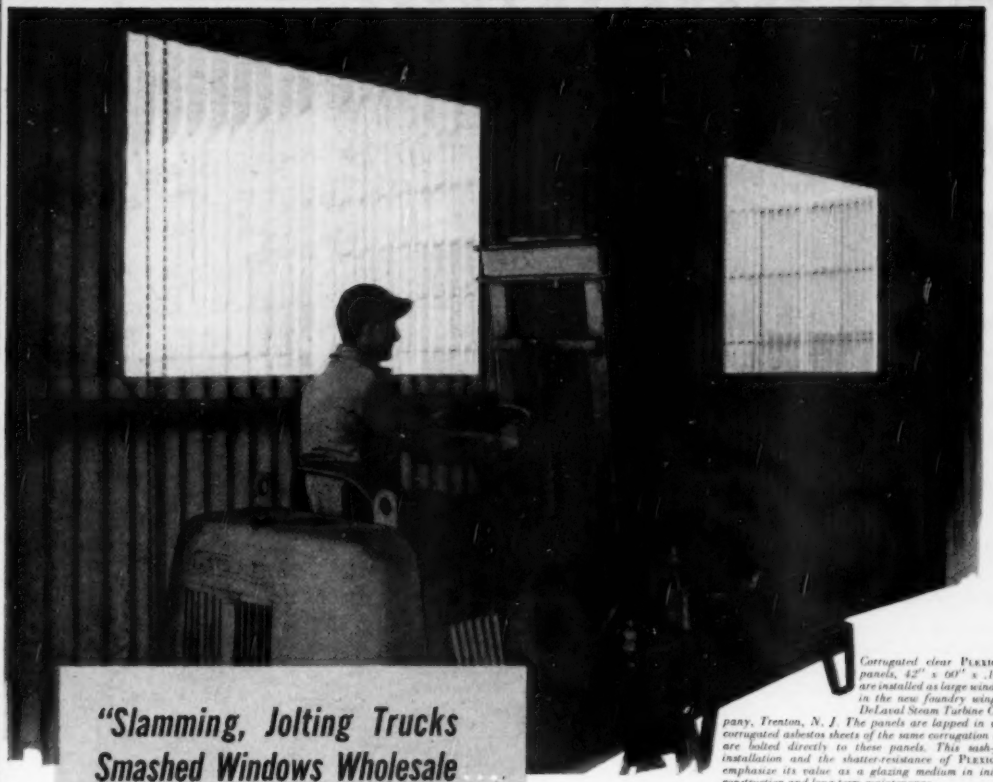

*Corrugated clear* PLEXIGLAS *panels, 42" x 60" x .125" are installed as large windows in the new foundry wing of DeLaval Steam Turbine Company, Trenton, N. J. The panels are lapped in with corrugated asbestos sheets of the same corrugation and are bolted directly to these panels. This sash-free installation and the shatter-resistance of* PLEXIGLAS *emphasize its value as a glazing medium in initial construction and long-term maintenance.*

## *"Slamming, Jolting Trucks Smashed Windows Wholesale . . .*

# UNTIL WE GLAZED WITH PLEXIGLAS"

**Shown here is what used to be a "high breakage area" in the DeLaval Steam Turbine Plant. Trucks and other mechanical equipment continually smashed glass in doors and windows—kiting maintenance costs and accident hazards—until PLEXIGLAS glazing was installed. Now management reports replacements practically zero.**

Wherever window breakage is a safety problem—or maintenance costs are high—you need PLEXIGLAS. It takes a hard, direct blow to break this tough acrylic plastic, and even then it does not shatter. And because of its lightness, PLEXIGLAS can be installed quickly, safely and with a minimum of support—even in large-area openings.

In industrial plants, housing projects, schools and hotels, PLEXIGLAS is paying for itself over and over again in savings on glazing replacements. Put this *Outdoor Plastic* to work for you. Write today for full details of optically clear, patterned or corrugated translucent PLEXIGLAS for glazing.

**SEND FOR FREE DETAILS NOW**

"GLAZING WITH PLEXIGLAS" gives interesting details on applications, workability and economies. Get your free copy today.

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CHEMICALS FOR INDUSTRY

**ROHM & HAAS COMPANY**

**WASHINGTON SQUARE, PHILADELPHIA 5, PA.**

*Representatives in principal foreign countries*

# THESE TROUBLEMAKERS

IN PLANTS EQUIPPED *with*

**CASH STANDARD** *Streamlined* PRESSURE **REDUCING VALVES** TYPE 1000

## THESE *Users* TELL WHY . . .

***A Conditioning Corp. writes—***

"Had a very critical job where it was important to HOLD CONSTANT PRESSURE TO VERY CLOSE TOLERANCES because we were using steam to reheat air to a set degree with allowed variation of less than one degree. Changed pressure reducing valves twice, then tried a CASH STANDARD Type '1000' and were able to accomplish the job."

***A Maintenance Engineer says—***

"I would be more than willing to recommend the performance of the CASH STANDARD Type '1000' Pressure Reducing Valve because we used the valve here UNDER ADVERSE CONDITIONS and found it PERFECT IN EVERY WAY—TROUBLE FREE and PRACTICALLY NO MAINTENANCE COSTS."

***A Supt. of a Public Utility says—***

"We operate a CASH STANDARD '1000' valve reducing steam pressure from 400 to 175 lbs. on our low pressure steam turbines' condenser air ejectors which is an important function and it has done the job WITHOUT FAILURE TO DATE."

***A Tobacco Co. writes—***

"We use only one '1000' valve in this department. It is used on the steam line to our Castle Autoclave (tough service). Our experience has been CONTINUOUS SMOOTH OPERATION for several years."

***An Instrument Co. writes—***

"Control of gasoline pressure on flo range of 5-4000 p. p. h. at 17½ psi. CONSTANT PRESSURE CONTROL over full range within 5%. This was on production test stands used for checking solid fuel injection on aircraft motors."

***WRITE FOR BULLETIN 962***

***Note the benefits*** users say they get from their CASH STANDARD Type '1000' Pressure Reducing Valves.

## *Check the benefits* with this list

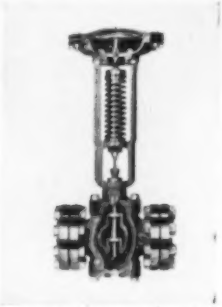
1. **Maximum capacity when needed most.**
2. **Accurate pressure control under toughest working conditions.**
3. **Trouble-free service.**
4. **Smooth operation.**
5. **Tight closure.**
6. **Speedier production results.**
7. **Elimination of failures.**
8. **Cost-saving operation.**
9. **No spoilage.**
10. **Practically zero in maintenance.**

**CASH STANDARD CONTROLS . . . VALVES**

**A. W. CASH COMPANY**
**DECATUR, ILLINOIS**

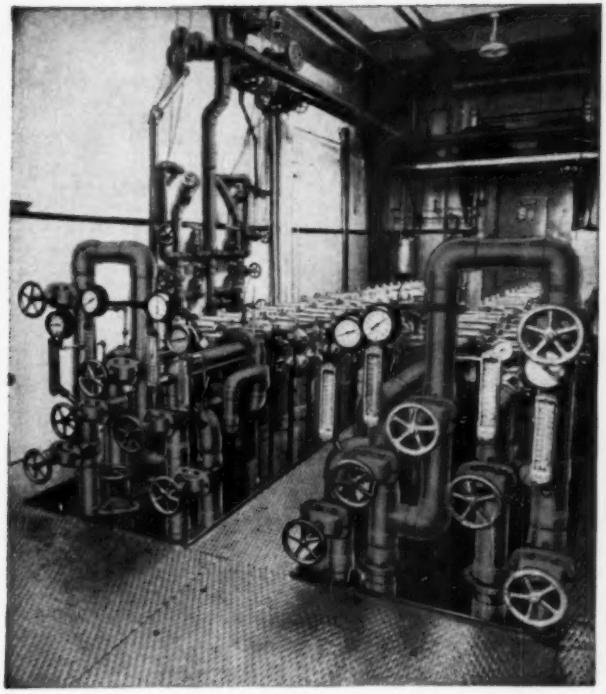
**BULLETINS AVAILABLE ON OTHER CASH STANDARD VALVES**
***Send for them***

Bulletin 963 features the CASH STANDARD Type 100 Series of Super-Sensitive Controllers — various types for automatically operating valves, dampers, rheostats, stokers, pulverizers, fans, and other apparatus. 16 pages filled with descriptions and applications.



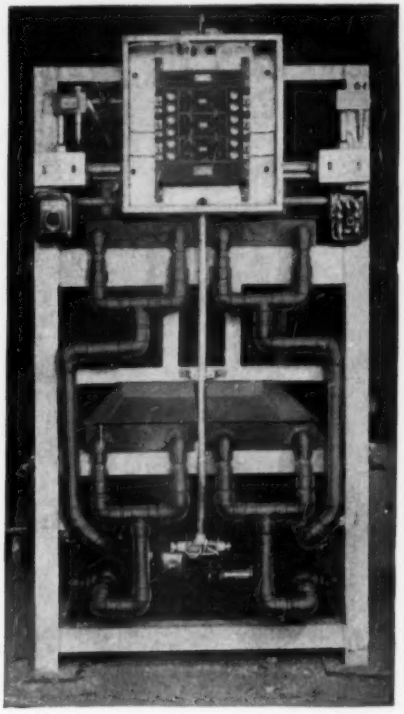
Bulletin 968 features the CASH STANDARD Type 34 Pressure Reducing Valve — direct operated — direct acting for handling steam, hot water, cold water, air, oil, brine—and most liquids and gases except some injurious chemicals. Illustrates and describes the different styles available and tells about their applications. Three pages of capacity charts.

Bulletin 956 features the CASH STANDARD Type 4030 Back Pressure Valve — designed to automatically maintain a constant pressure in the evaporator corresponding to a constant temperature desired. Shows an Ammonia and Freon Gas Capacity Chart based on ABSOLUTE pressures.



(Left) Copper pipeline installation for wort coolers at the P. & M. Schaefer Brewing Co., Brooklyn, N. Y.

(Below) Pilot plant equipment in the laboratories of Chas. Pfizer & Co., Inc., Brooklyn, N. Y., manufacturers of fine chemicals and pharmaceuticals.



*For Carrying Hot or Cold Water, Gases, Compressed Air, Refrigerants, Oils . . .*

## YOU SAVE WITH PIPELINES OF COPPER

YOU save three ways — on installation time, on maintenance and on long-term service.

Copper tubes are speedily installed with solder-type fittings. Because soft-annealed copper tubes can be bent to clear obstructions, fewer fittings are needed in many types of installation. Joints can be made readily in cramped spaces. Easy to set up, copper tube pipelines are equally easy to dismantle.

Solder fittings give uniformity of bore to copper tube piping; flow is unimpeded at joints, and the rust-free surface of copper means a low coefficient of friction, with reduced pumping costs. The corrosion resistance of copper provides assurance against premature pipe replacement and excessive maintenance.

Whether you require capillary tubes of .025" I.D. or cold-drawn seamless tubes as large as 26" I.D., ANACONDA Copper Tubes offer basic advantages found in no other single piping material. Write for ANACONDA Publication C-24, containing detailed information on the industrial applications of ANACONDA Copper Tubes. The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario.

•

ANACONDA *Copper Tubes in commonly used types and sizes are stocked by wholesale distributors from coast to coast.*

4073 Rev.

***For better Piping . . . use*** **ANACONDA**

**COPPER TUBES**

# Macy's

*San Francisco*

## gets extreme flexibility

to handle load changes and future load growth

## low installation cost

everything was shipped complete—as a unit—and easily installed

## safety to personnel

no exposed circuits; metal encloses all current-carrying parts

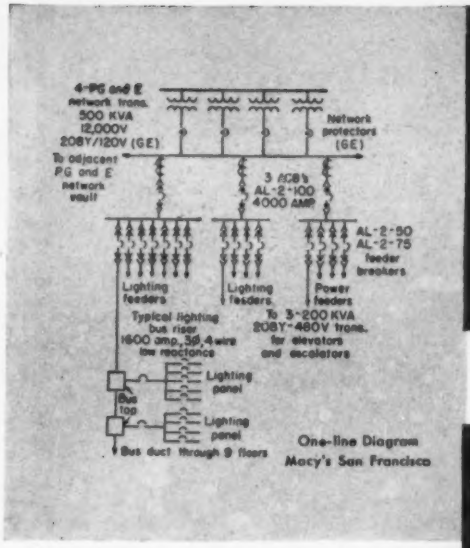
## plenty of "IC"....with

100,000 amperes interrupting capacity, adequate to handle all short circuits

## GENERAL ELECTRIC

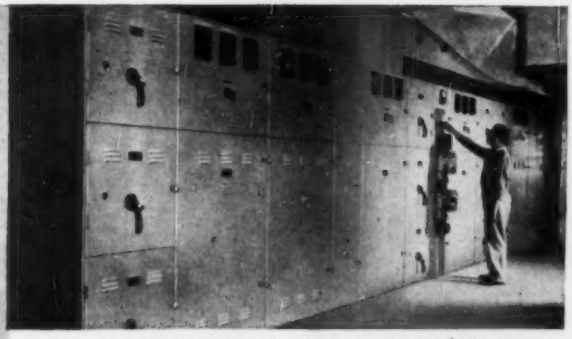
*HERE'S WHY . . . "In the department store business we cannot take any chances with power outages or potential fire hazards. We must also plan for expansion. That's why we wanted our power distribution system to be safe, to have adequate feeder and branch-circuit capacity, plus flexibility. General Electric switchgear gave us all these requirements."*

E. L. MOLLOY, VICE PRESIDENT
MACY'S, SAN FRANCISCO

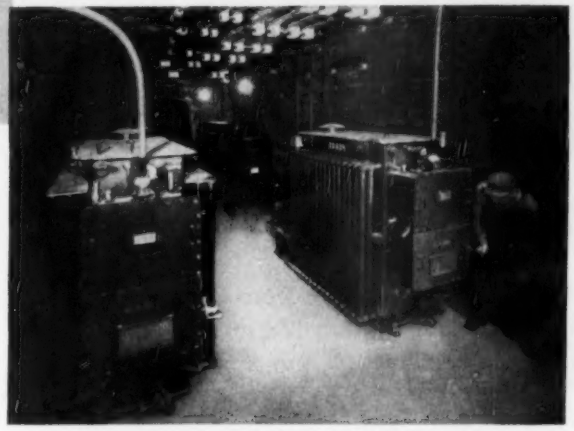

4-PG and E network trans. 500 KVA 12,000V 208Y/120V (GE)
Network protectors (GE)
To adjacent PG and E network vault
3 #GB's AL-2-100 4000 AMP
AL-2-90
AL-2-75
feeder breakers
Lighting feeders
Lighting feeders
Power feeders
Typical lighting bus riser 1600 amp, 3ϕ, 4 wire low reactance
To 3-200 KVA 208Y-480V trans. for elevators and escalators
Lighting panel
Bus top
Lighting panel
Bus duct through 9 floors
One-line Diagram Macy's San Francisco

This, the largest switchgear installation to date in any San Francisco commercial building, adequately handles the power requirements that average four watts per square foot (nearly 500,000 square feet). Flexibility of the feeder system permits load changes without increasing the load on the switchgear. The 4000-ampere breakers have induction relay tripping.

Macy's installation is a complete General Electric project—switchgear, three 200-kva transformers for elevators and escalators, power and lighting panels, motors, and control for ventilating and boiler-room auxiliaries. One source of responsibility plus the very best in co-ordinated planning, engineering, manufacturing, and service facilities to give maximum savings and efficiency to the customer.



G-E metal-enclosed switchgear handles the incoming 120/208-volt power. The equipment is divided into three sections, two for lighting, one for power. Breakers (cascaded) are of the drawout type for ease of inspection and maintenance.



Four G-E network units, rated 500 kva, 12,000-120/208 volts in a Pacific Gas and Electric Company vault serve the building. Macy's 2500-kva load represents one of the largest loads added to PG&E's downtown network in recent years.

# low-voltage SWITCHGEAR

Modern industrial power distribution systems using G-E switchgear are applicable to any industrial plant or commercial building where you want proper voltage for top performance of equipment, an extremely flexible setup to take care of expanding or changing loads, adequate short circuit protection, safety to personnel, and low installation and maintenance costs.

**Be sure to see the "More Power to America" full-color sound slidefilm "Modern Industrial Power Distribution." Ask your G-E sales representative to arrange a showing for your organization.**

Investigate today the many advantages of using General Electric switchgear in your plant for efficient, flexible power distribution. Contact your G-E sales representative for further information—and write for the helpful bulletins listed below. *Apparatus Department, General Electric Company, Schenectady 5, N. Y.*

GEA-4966 Low-voltage Switchgear
GEA-3642 Air Circuit Breakers
GEA-2017 Network Protectors
GEA-3083 Metal-clad Switchgear
GEA-3592 Load-center Substations
GEA-3758 Load-center Distribution

GENERAL ELECTRIC

# REPUBLIC ELEVATOR BELTING Ended Costly BREAKDOWNS IN THIS QUARRY

**Not one breakdown since Republic Elevator Belting was installed two years ago**—that's the story at the T. B. Gatch & Son Quarry in Calvary, Maryland!

Their primary crusher spews out hundreds of tons of crushed rock daily, and every pound of it is carried off via elevator belting. When other ordinary belts proved inadequate, and a series of paralyzing breakdowns disrupted production schedules, Republic was called in to analyze the problem.

Republic's Baltimore Distributor, Robins Rubber Division of the A. K. Robins & Company, recommended Excelo Elevator Belt.

Today, after a grueling two-year run, the same belt is still giving uninterrupted service . . . going strong as ever!

Matching the product to the job is a Republic policy that's paved the way for success stories like this in every industry. This service, meaning trouble-free operation, is available to you. So write us today about your toughest hose or belting problems. We'll introduce you to your local Republic Distributor . . . a man who has the answers! Remember, Republic Rubber has been *the* specialist in the industrial rubber goods field for more than 48 years.

*Mr. H. E. Brodnax, Manager*
*Robins Rubber Division*
*A. K. Robins & Company, Inc.*
*Baltimore, Md.*

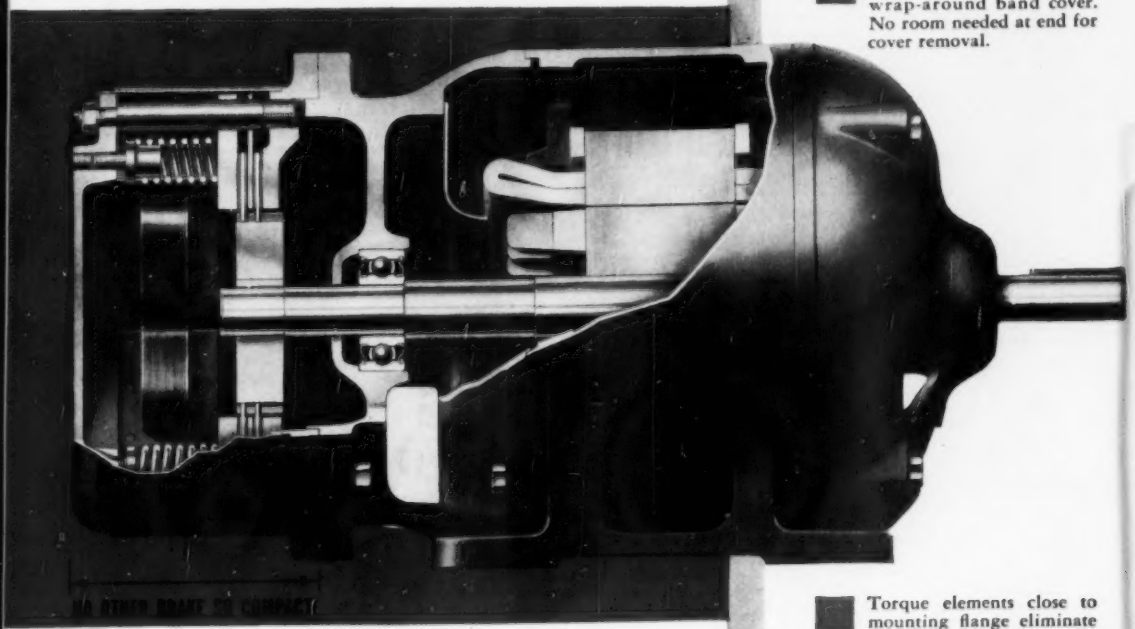
Pioneers in the use of COLD RUBBER

**REPUBLIC RUBBER DIVISION**
LEE RUBBER & TIRE CORPORATION, YOUNGSTOWN, OHIO
Lee Deluxe Tires & Tubes - - - Conshohocken, Pa.

MECHANICAL RUBBER GOODS BY
**REPUBLIC RUBBER DIVISION**

# NEW! Money-saving Crocker-Wheeler BRAKE MOTOR

**Engineered a step ahead of any in its field — maintenance savings never before possible!**



- Bonded metal brake linings practically eliminate need for adjustments — outlast others 3 to 1.
- Adjustments for brake lining wear (if necessary) can be made from *outside*.
- Large diameter brake spline with large number of teeth decreases load per tooth . . . increases life of spline and discs.
- Brake totally enclosed for added protection. Simple wrap-around band cover. No room needed at end for cover removal.
- Torque elements close to mounting flange eliminate difficulties often encountered with overhung brakes.
- Brake leads are brought into motor conduit box so that they can be connected in motor circuit or energized separately. Saves wiring trouble in original installation.
- Magnets and springs symmetrically spaced for equalized pressure and low brake lining wear.

From wear-resistant brake linings of bonded metal to the short overall mounting dimension of its brake, this new Crocker-Wheeler Brake Motor is built to cut operating and maintenance costs. In the panel (right) are some of the many money-saving features. Here's a brake so compact it can be used in the most limited space. It's the only brake that can be attached to a standard double shaft D flange (for frames 203-326) or C face motor (for frames 364-405)—with no special mounting brackets or adapters required. Brake unit is available for separate mounting.

*Get all the facts* on the new, totally-enclosed Crocker-Wheeler Brake Motor. Send coupon at once for new Bulletin.

## ELLIOTT COMPANY

### CROCKER-WHEELER DIVISION

**Ampere, N. J.**

Branch Offices: Atlanta, Birmingham, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Dallas, Denver, Detroit, Houston, Kansas City, Los Angeles, Milwaukee, Minneapolis, New Orleans, New York, Newark, Philadelphia, Pittsburgh, St. Louis, Salt Lake City, San Francisco, Seattle, Tulsa, Washington, Wilmington. Representatives in principal cities.

ELLIOTT MOTORS LARGER THAN THE CROCKER-WHEELER LINE ARE BUILT BY THE RIDGWAY DIVISION AT RIDGWAY, PA.

Elliott Company, Adv. Dept.
Jeannette, Pa.

Please send new Bulletin SL-610-1, describing Crocker-Wheeler Brake Motors. PE-350

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Title or Function _____

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# Plant Engineers' Digest

## Low Pressure Boiler Can Cause Big Blast

THE FACT THAT safety devices should receive proper care and maintenance, whether located on high pressure boilers or the so-called low pressure boilers, was again demonstrated in the explosion of a heating boiler in an institutional building.

The boiler was of the firebox type, 42 in. in diameter, of welded construction and built for 15 psi maximum steam pressure. Although the boiler was hand fired with coal fuel it was equipped with a forced draft fan which was controlled automatically by a pressure-actuated cut-off switch. No other automatic controls were used. The boiler also provided steam for heating water for service purposes.

When the boiler exploded the wrapper sheet was blown off, having pulled away at the staybolts and torn at the seams, and the furnace side sheets were collapsed. The boiler was thrown from its setting by the blast and damaged a companion boiler and the hot water tank. Water was discharged into the basement and filled it to a depth of several feet.

The boiler pressure and water level had not been observed immediately prior to the accident, but the fireman reported that there was no pressure showing on the gauge at the time of his last visit to the boiler about an hour before the explosion. He said the fires were banked at that time.

The pressure gauge could not be found after the explosion, but the safety valve, which had been blown off the boiler, was found and tested by police officials who advised that it failed to open when they tested it at 300 psi water pressure. After this test the police had cut the safety valve into sections, and corrosion was observed at the valve seat and spindle.

From the information available, it appears that something went wrong with the pressure control for the forced draft fan, and with the safety valve out of commission the steam pressure built up until the boiler exploded. *From The Locomotive, Oct. 1949 a publication of The Hartford Steam Boiler Inspection and Insurance Co., Hartford 2, Conn.*

## Methods for Treating Cyanide-Bearing Wastes

WATER IS seldom credited with being the universal raw material, yet in industry each pound of finished product can require as much as 300 lb of process water. Most industries require process water and seldom return it to the streams and rivers in the condition received.

The discharged water, known as industrial waste, because it is composed of extraneous or waste materials picked up in the processing, often contains offensive, foul and toxic materials that pollute the streams.

The waste from each industry and each industrial process must be considered carefully and studied thoroughly before treatment can be realized on a rational and economical basis. An example will serve to illustrate the problem.

Those industries using electro-plating and case-hardening employ cyanide salts and the waste waters from them usually contain cyanides, a particularly toxic material which even in minimum doses is lethal to man.

Several methods of treating cyanide-bearing wastes have been developed and utilized according to the individual problems involved. Dilution is perhaps the simplest method of treatment, applicable only where sufficient diluting water is available to maintain the concentrations below extremely low limits.

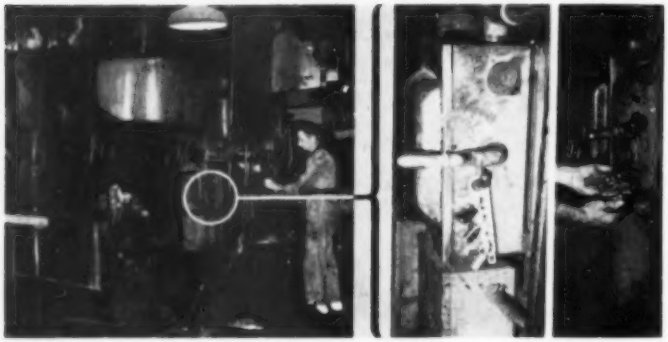
Treating the waste with acid, known as acidification, and volatilizing the poisonous hydrogen cyanide to the atmosphere through stacks is now practiced at some manufacturing plants. Sulphuric acid is normally employed to decompose the cyanides. The hydrogen cyanide formed is then blown with air or heated with steam to release the gas upward through escape stacks. The process is efficient but its chief drawbacks are the initial cost and the bulk of equipment required.

Another method is the treatment of the wastes with metals that react with the soluble cyanides to form insoluble metallic cyanides that can be removed by precipitation. However, the cost of the metallic compounds makes such a procedure rather expensive.

Still another method of treatment consists of evaporating the waste to dryness. This might be practical for small amounts of cyanide waste but the problem of disposing of the resulting concentrate would then arise.

The method which is receiving the widest reception in this country and the one which is coming into most general use is oxidation in an alkaline solution. Chlorine is used for this purpose because of its inexpensive oxidizing agent and its availability. It is applicable to practically every type of cyanide waste encountered in this country. *From Chlorination Topics, Dec. 1949, a publication of Wallace and Tiernan Co., Inc., Newark, New Jersey.*

## New Safety Device Protects Repairmen



This new safety device is shown in use. These repairmen demonstrate how all three can work on a big press secure in the knowledge that no one of them can throw on the master switch by mistake until all have finished their work. As each man completes his work he removes his padlock. The man who is last to remove his lock can then turn on the switch safely. Close-ups of the safety lock can be seen at right. (From the Pontiac Warrior, Dec. 1948, a publication of Pontiac Motor Division, GMC, Pontiac 11, Mich.)

## The Plant Engineer Was Puzzled

A LARGE textile mill employing two shifts began the work day at 7 a.m. and closed down at 11 p.m. This plant was idle from 11 o'clock at night until 7 o'clock the next morning.

At closing time all lights were extinguished except for the few always used even when the plant was idle. The plant remained dark from 11 p.m. until 5 a.m., when somebody began turning on lights and the load began building up.

The plant engineer was surprised and puzzled. He examined charts of a power survey made with graphic instruments, and found indications of a considerable lighting load during early morning hours when the mill was closed. This didn't add up quite right.

Here was something that needed investigation. So the plant engineer got out of bed early one morning and hied himself to the mill, arriving before 5 o'clock, to find out the reason for the heavy load.

What he saw in the next two hours was almost incredible. Believe it or not, workers on the day shift began arriving at the mill almost two hours early! These lonely hill people came to sit around and talk with their fellows. Of course, they switched on the lights. As more came in, more lights were turned on, until finally the entire plant

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## Ask any user . . . you'll find them everywhere

In scores of industries, users of Wickwire Rope have developed an affectionate respect for its performance, safety and long life. And, for true economy, they use Wickwire's WISSCOLAY® *Preformed*. It lasts longer — is easier to cut, splice and install. It's kink-resistant and safer to handle. Wickwire Distributors and Rope Engineers, in key cities everywhere, are prepared to render prompt service in meeting your wire rope needs. Wickwire Rope Sales Office and Plant — Palmer, Mass.

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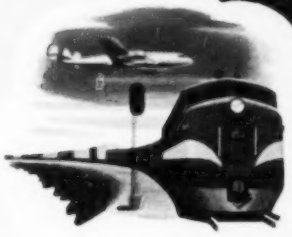
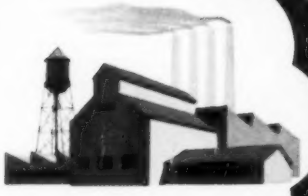
LOGGING



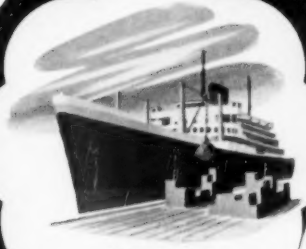
TRANSPORTATION

MINING

PETROLEUM



MANUFACTURING



MARINE

CONSTRUCTION

was illuminated. All lights in the plant were burning brightly—and still fifteen minutes to go before work began.

The remedy was simple. Not wishing to discourage employes who like to come to work early, the company designated a section of the plant where early arrivals could congregate—and the small cost of lighting this section was gladly absorbed. *From Solving Industrial Crimes, Case No. 38, a publication of The Esterline-Angus Co., Inc., Indianapolis, Ind.*

## If You Work With Acid or Caustic—

YOU MAY HAVE heard this one, but it bears repeating: If you are working with an acid or caustic, treat it with the same respect as you would a coiled rattlesnake. It can be just as deadly. Remind yourself of these things before you start to work with a corrosive liquid:

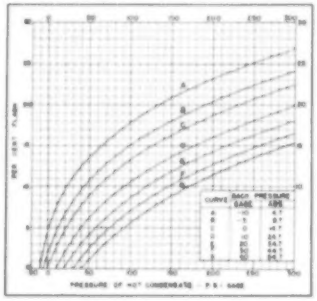
1. Put on your protective equipment—it won't bother you at all compared to an acid or caustic burn. 2. Which are you using—acid or caustic? There is a difference. Caustic is not an acid, it is an alkali. Caustic burns can do as much damage as acid burns. 3. Remember where the nearest shower is and be certain that it is working. If you'll need it—you'll need it fast. 4. If you are burned by acid or caustic, get under the shower but quick and do not spare the water. It takes a lot of water to counteract acid or caustic. As soon as you get under the shower, get your clothes off, since you want your skin counteracted, not your clothes. Stay under the shower until the nurse arrives. Let her be the judge as to whether you have used enough water.

Remember, you are on your own for those first few seconds and they are very important. They can make the difference as to how serious your burn condition will be. *From suggestions submitted by three safety-conscious men in an article in The Staley Journal, Nov. 1949, a publication of A. E. Staley Mfg. Co., Decatur, Ill.*

## Chart for Calculating Flash Steam

ENGINEERS desiring to know how much flash steam is formed upon condensate being discharged to return lines, whether for use in a heating system or for process steam supply system, can easily and quickly find the answer on the chart shown.

Supposing in a given plant some 100,000 lb of condensate per hour at an initial presure of 120 lb is discharging



This chart will help you in calculating flash steam

to a back presure of 30 lb (gage). How much flash steam would be formed?

Going to the chart, the back pressure table (inset) indicates 30 lb back pressure to be curve F. After locating the 120 psi on the horizontal base line, move vertically up to where this line intersects curve F and take your reading, in this case, 8.5 per cent. Since this figure is the per cent of flash steam formed per pound of water, the total flash steam formed would be 100,000 x 8.5 per cent or 8500 lb per hour available for other use. *From an article in Armstrong Trap Magazine, No. 1, 1950, a publication of Armstrong Machine Works, Three Rivers, Mich. Reprints of the article and chart are available from the manufacturer upon request.*

## H Stands for Hornet Bomb

"HOT" HORNETS—in the radioactive sense, not just with their stingers—promise to be useful in the safety program of the Atomic Energy Commission. The potential helpfulness to man of these energetic but not-too-popular insects is disclosed in the semi-annual report of the AEC.

One curious but until now apparently useless fact of natural history was the knowledge that the common white-faced hornet accumulates the element barium in its body. Barium, a chemical relative of the more familiar and abundant calcium (lime) is widely distributed in nature. It is also one of the lighter elements formed in the radioactive breakdown fo the heaviest natural element, uranium, the atom-bomb metal.

Researchers on military and peaceful uses of uranium naturally do not want escaping atomic fragments strewing the countryside with dangerous pollution. So it is proposed to encourage colonies of hornets to live in the neighborhood of nuclear-fission laboratories, and to seek their food among plants exposed to possible radioactive leaks. From time to time some of them will be captured, killed and analyzed. If they assay too high in barium, there is a "hot" leak somewhere, that has to be found and stopped. *From Science News Letter, a publication of Science Service, Inc., Washington 6, D. C.*

## Industry Takes Over a Radio Station

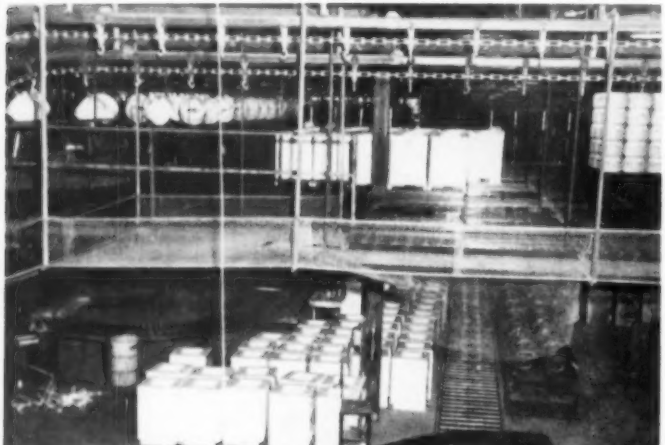
A COMPANY recently installed a radio station in its plant for the purpose of dispatching trucks within the plant limits.

Even though it is used for no other purpose, it was necessary to obtain a license from the Federal Communications Commission before it could be installed or used. The company told in detail how the station was to be used, and it can be used for no other purpose. The FCC sets down certain rules and regulations which have to be strictly complied with.

The short-wave station operates on 154.49 megacycles and is the same type as that used by police and taxi companies for communicating orders to cars and fleets.

By using this communication system, the dispatcher generally knows

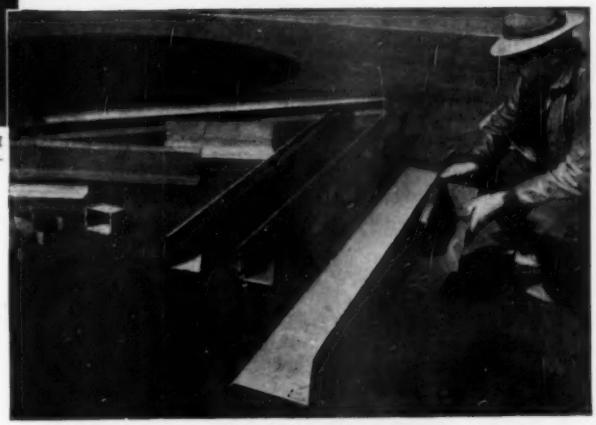
## Do You Have a Storage Space Problem?



This mezzanine area was constructed to give more storage space. The distance from the factory floor to the mezzanine is 12½ ft; from the mezzanine to the lowest beam overhead is 7½ ft. The area is 72 ft wide by 83 ft long. The flooring material is of open grating 1 in. by 3 in. A safety rail, 42 in. high, extends around the entire area. The area is reached by a stairway. (From the Maytag Bulletin, Vol. VII, No. 24, a publication of The Maytag Co., Newton, Iowa)

# Your ROOF doesn't have to be Overhead!

*Monel parapet flashing, siding, skylight trim and gutters. Installed on a coal-burning power plant in 1913, they are still in good condition.*



*These Monel gutters, base, cap and step flashings, down spout straps and eave boxes were installed on a chemical manufacturing plant, where they are successfully resisting destructive fumes, smoke and lowland dampness.*

***Now, with the new economical Monel Roofing Sheet, it is often cheaper to install a new Monel roof than to keep paying repairs for a leaky roof.***

Tired of short-lived roofs and roofing parts?

Then turn to the metal that can end your problem . . . *Monel**.

Monel is an alloy consisting of approximately $\frac{2}{3}$ nickel and $\frac{1}{3}$ copper. Throughout industry it is known for its resistance to corrosion and rusting . . . severe stresses . . . wear . . . buckling and cracking at extreme temperatures.

It is doing hundreds of different jobs (*tough jobs*) in many fields, in many forms.

To you it offers a chance to cut your annual outlay for roof maintenance. Just look at the record. Monel roofing installations date back to 1910. Most of them have never required a penny for subsequent repairs.

No wonder Monel roofing is called "life-of-the-building" roofing.

Investigate Monel roofing for your own plant buildings. At a practical cost, you can have an entire roof of Monel, or Monel roofing parts such as drainage systems . . . flashings . . . skylight frames . . . ventilators . . . louvers . . . ducts . . . siding . . . expansion joints . . . copings . . . canopies . . . terrace sheathing.

## MONEL ROOFING

*For the "Life-of-the-Building"*

**Send for our booklet, "ONE METAL ROOF"**

*It shows typical installations, tells about Monel's many advantages, cites long service records. Included in the booklet is a sample of Monel roofing sheet.*

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The International Nickel Company, Inc.
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*Please send me a copy of "ONE METAL ROOF" and the sample of Monel Roofing Sheet.*

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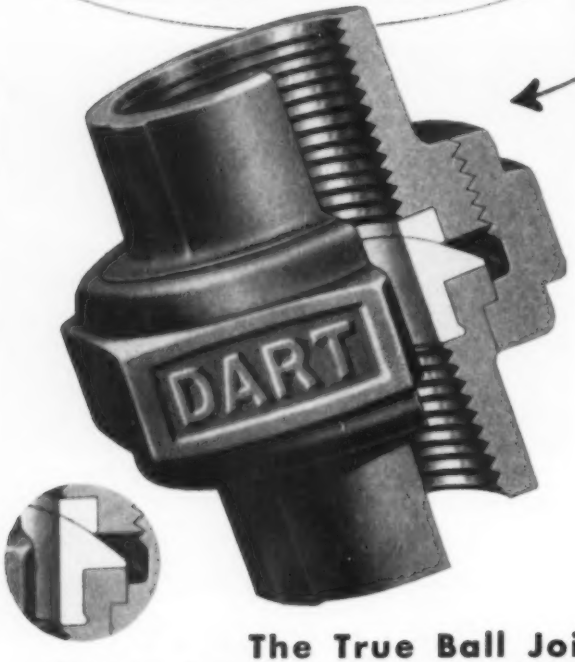
Company .....
Address ..... PE 3-50
City ..... State .....

**THE INTERNATIONAL NICKEL COMPANY, INC.**

*Reg. U. S. Pat. Off.

**67 Wall Street, New York 5, N. Y.**

# YOU CAN USE A DART OVER AND OVER AGAIN




## The True Ball Joint Makes Possible Repeated Use

A Dart Union is the economy — the money saving — union, for you can use it in many successive installations. Because the two bronze seats are spherically ground, a Dart closes tight without excessive wrenching. You don't need to jam or stretch the seats to get tightness. After use, it uncouples easily — seats are uninjured — ready for another installation.

Insist on DART UNIONS for *true* economy.

**E. M. DART MFG. CO.**
**PROVIDENCE 5, RHODE ISLAND**

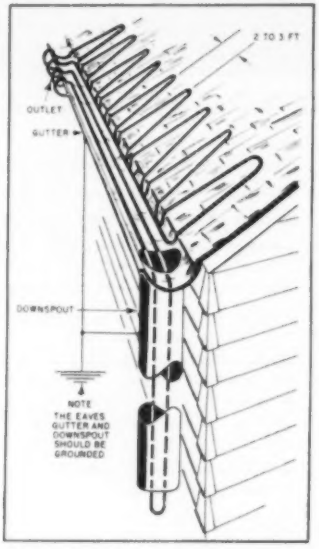
**DART**
**UNIONS**


where each mobile unit is. Operators tell the dispatcher where they are going and where they expect to stop along the way.

Since the system has been in effect, all persons using it have found it a great time saver. Unit operators find they are making one through trip, with several stops along the way now, instead of doubling back several times over the same route. Supervisors and foremen who need equipment in a hurry, can often get it almost at once. *From The Staley Journal, Nov. 1949, a publication of A. E. Staley Mfg. Co., Decatur, Ill.*

## Roof De-Icer Prevents Ice Dams

LEAD COVERED heating cable is being used to prevent ice dams on roofs. In buildings equipped with gutters and downspouts, a saw tooth arrangement can be used on the eaves with a double length of lead covered heating cable installed along the gutter and hanging in the downspout (see sketch). In this




**This sketch shows the correct method of installing lead covered heating cable when gutter and downspout are to be kept open. The electrical outlet is located outside building under the eaves**

way, the cable melts channels through the ice and snow, thus permitting free drainage of water. In metal gutters, the cable should be layed on wooden strips or blocks so that it does not come into contact with the gutter. The metal gutter and downspout should be grounded.

To supply power to the heating cable, it is recommended that a weatherproof convenience outlet be installed on the outside of the building, preferably under the eaves. As a safety precaution, this outlet should be unplugged during off-season months.

The cable should never be used where the sheath temperature will exceed 165 F.

The tabulation below shows the lengths of cable recommended for the

# GOOD

## ROBBINS & MYERS *Uni-Shell* MOTORS

## NOW *made up to* 50 *h.p.!*

You asked for it. Here it is! Now you can get *R & M performance* in larger motors, too—from 1 to 50 h.p. in all motor types. It's one of the most welcome bits of news for Plant Maintenance Men since *steel-shell* R & M Uni-Shell Motors were first announced in 1942. And the many advantages of this modern design are even *more important* today.

**BUILT TO KEEP GOING** . . . Robbins & Myers Uni-Shell Motors *excel* in the three construction requirements for long, low-maintenance service. (1) *Durable Insulation*—the phase groups, as well as the coil groups, are insulated. (2) *Adequate Ventilation*—outside air circulates at high velocity through the rotor as well as between windings and shell. (3) *Long Bearing Life*—extra-wide ball bearings are double-sealed and prelubricated for years of use without re-greasing.

**YOU SAVE TIME** . . . All motor types in each frame size have *identical* mounting dimensions. Should current characteristics or service needs change, installation of a new motor is thus conveniently simplified. R & M Uni-Shell Motors are good motors—*easy to maintain.* Ask any R & M user.

*Your R & M Motor Distributor will be glad to give you the interesting "inside story." Literature and recommendations on request. Please address Department J-30.*

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Springfield 99, Ohio • Brantford, Ontario

MOTORS • HOISTS • CRANES • FANS • MOYNO PUMPS • FOUNDED 1878

# Compact Power! Rugged Strength! Tremendous Leverage!

Snap-on*

*twenty-one piece • 1" Square Drive*

## Extra Heavy Duty Socket Set

LOXOCKET CONSTRUCTION

A positive acting button lock makes any combination of units as safe as a one-piece wrench. Easy release allows you to interchange sockets swiftly and easily.

THESE tools give you the extra power and leverage to break loose big rusted-on nuts and bolts, or to pull them up to the tightest degree. It is a husky set that speeds the heaviest nut-turning work with great safety because of the famous Loxocket design.

No. 521-EHD-B Set includes 17 Hexagon Loxockets from 1-7/16" to 3-1/8". The handle equipment consists of a Ratchet Head, Sliding Bar and two Extension Bars, 8" and 16" long.

* T. M. Reg. U. S. Pat. Off.

SNAP-ON TOOLS CORPORATION

8068-C 28TH AVENUE
KENOSHA, WISCONSIN


more common voltages and the resultant wattages:

| Length in Feet | Volts | Total Watts |
|---|---|---|
| 60 | 110 | 400 |
| 120 | 220 | 800 |
| 240 | 440 | 1600 |

Shorter lengths should not be used with these voltages as such practice will increase the wattage and operating temperature and shorten the life of the cable. Longer lengths can be used, in which case the total wattage will decrease. When used in the length indicated, the sheath temperature in free air will be approximately 95 F above the surrounding air temperature.

Lead heating cable is also suggested for protecting water pipes, warming valves and pipe lines carrying viscous material, acid baths, freeing sidewalks from ice, soil heating and floor heating. *From Lead, Vol. 17, No. 4, a publication of Lead Industries Association, New York 17, N. Y.*

## Smoothness Goes on the Gold Standard

IT WON'T be long before the new-type gage blocks will be used to help turn out better automobiles. These new blocks, cast from a gold-plated master set, will be used to measure the smoothness (or roughness) of a surface just as the famous Johansson blocks are used as the standard for dimensional measurement.

Looking at many of the finer machined or ground surfaces under a

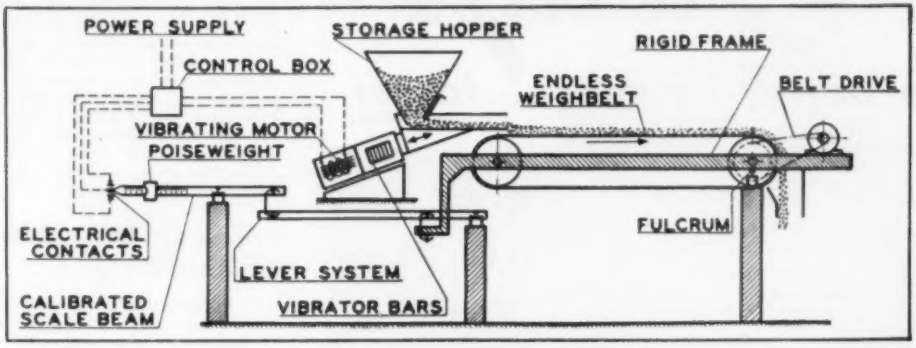
**Specimens of 27 degrees of graduated roughness will be supplied to industrial users in thin pocket-size metal cases, with three or four roughness specimens packed in a single case for protection**

microscope will surprise you. When magnified, all surfaces — whether machined, ground, honed or lapped—consist of a series of irregular peaks and valleys. Several millionths of an inch may separate the peaks from the valleys, and it is the distance between these points that can be controlled now that standards of measurement have been developed.

Master surface-finish standards in-

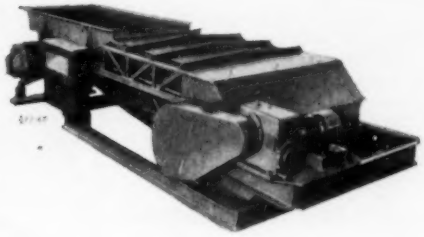
# CONTINUOUS GRAVIMETRIC FEEDING

ACCURATE
FLEXIBLE




**(PATENTED)**

**For accurate weighing, feeding, batching and proportioning there is this Jeffrey-Traylor WAYTROL — a precision machine with rate of delivery automatically regulated. Control is electrical and instantaneous. Compensating for error, the WAYTROL provides a system of continuous weighing, following exactly the theory of precision of measurement upon which it is based. Let us tell you more about this unit with the "Electric Brain."**



TYPE 450 WAYTROL

**Partial List of Materials being fed by WAYTROLS**

| | | | |
|---|---|---|---|
| Activated Carbon | Coal | Iron Borings | Sand |
| Alum | Coke | Iron Ore | Shale |
| Ammonium Sulphate | Explosives | Limestone (crushed) | Soda Ash |
| Bauxite | Feldspar | Limestone (pulverized) | Starch |
| Borax | Fluorspar | Pebble Lime | Talc |
| Cement Clinker | Food Products | Plastics | Tobacco |
| Cement (finished) | Fullers Earth | Potash | Wood Chips |
| Chemicals | Gypsum | Salt Cake | Wood Flour |
| Clay | Glass Cullet | | Zinc Ore |
| | Hydrated Lime | | |

SIZES AND CAPACITIES

| Type | Capacity per hour (based on 100 lb. Granular Material) | | Feeder HP | Shipping Weight Lbs. |
|---|---|---|---|---|
| | Minimum | Maximum | | |
| 116 | 60 lbs. | 6,000 lbs. | 1/16 | 1,050 |
| 220 AC | 300 lbs. | 15,000 lbs. | ¼ | 1,800 |
| 220 MC | 300 lbs. | 30,000 lbs. | ⅓ | 1,900 |
| 330 | 1000 lbs. | 100,000 lbs. | 1 | 3,800 |
| 450 | 2000 lbs. | 200,000 lbs. | 1 | 6,000 |
| 5080 | 5000 lbs. | 500,000 lbs. | 2 | 12,000 |

ELECTRIC VIBRATING } Feeders Coolers Conveyors Packers Bin Valves Screens Dryers Waytrols Bin-Level Controls Mixers

# THE JEFFREY MANUFACTURING COMPANY

Established 1877

905 North Fourth St., Columbus 16, Ohio

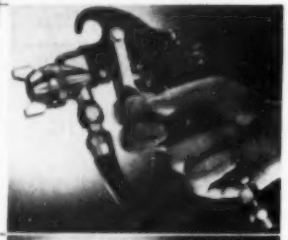
Complete Line of Material Handling, Processing and Mining Equipment

Baltimore 2 · Birmingham 3 · Boston 16 · Buffalo 2 · Chicago 1 · Cincinnati 2 · Cleveland 13 · Denver 2 · Detroit 13 · Horton · Houston 5 · Huntington 19 · Jacksonville 2 · Milwaukee 2 · New York 7 · Philadelphia 3 · Pittsburgh 22 · St. Louis 1 · Salt Lake City 1 · Scranton 3

# 3 ways to better finishes... faster

**1st way... use a Model 18**

latest addition to the Binks line... a precision gun for obtaining the finest finishes possible at the lowest cost. In designing this gun, Binks asked users what they wanted in a spray gun. Model 18 is the answer.



**2nd way... use a Model 7**

a heavy-duty production gun. This is a long time favorite with wide acceptance in the finishing field. Gun body is drop-forged aluminum with a tough, black electrolytic coating. All parts are of long lasting, wear resistant materials.

**3rd way... use a Model 19**

a truly remarkable, lightweight production spray gun, employing the same nozzles as Model 18. Reduces fatigue. Body is nickel-plated aluminum. Cartridge-type air valve is economical, easily replaced as a unit.

Binks "Big 3" spray guns are the favorites of industry everywhere. They lead the way to better finishes... faster. When Binks precision-made guns are on the job, you will have finer finishes; rejects will be cut to a minimum; production will be greater; finishing costs, lower.

Take hold of a Binks spray gun. Feel its perfect balance. Note the convenient back-of-gun location for controls... the precision construction of all parts... the fast, uniform coverage and adjustable spray pattern.

All Binks gun parts are made of specially selected, wear-resistant materials. The air nozzle is of nickel-plated bronze; the material nozzle is made of hardened steel with self-centering needle. Cartridge-type air valves are employed in all three models. Because of such sound engineering and manufacturing know-how, Binks guns stand up under hard production use... that's extra economy for you.

"Binks is justly proud of its 'Big 3' production guns. They produce, at minimum cost, the high quality finishes demanded by the buying public."

Chairman of the Board

**Write now** for free information on these guns.

**Binks MANUFACTURING COMPANY**

3126-30 Carroll Ave., Chicago 12, Ill.

NEW YORK DETROIT LOS ANGELES ATLANTA BOSTON CLEVELAND
DALLAS MILWAUKEE NASHVILLE PHILADELPHIA PITTSBURGH
ST. LOUIS SAN FRANCISCO SEATTLE WINDSOR, ONTARIO, CANADA


clude 18 original specimens of different degrees of surface roughness. They were prepared by ruling fine creases in highly polished gold plated surfaces by means of a small diamond point. Measured pressure on the diamond point was increased for each of the blocks to provide different depths of the creases and thus different samples of surface roughness. An electro-plating process is used to produce exact copies of the master blocks. These copies are gilt-edge security for accurate roughness measurement. *From GM Folks, Nov. 1949, a publication of General Motors Corp., Detroit 2, Michigan.*

## Nylon is Excellent Insulator for Stator Wire

IT PROBABLY will not appear on the fashion pages, but the latest thing in electric motors is a nylon coat. More specifically, nylon plastic has replaced enamel as insulation for the wire that is wound on stators.

Stator wiring had previously been done with enamel-insulated wire. This, however, was brittle, and somewhat low in heat-resistance. The new nylon coating can stand more heat, and in addition, does not chip. A nylon-coated wire, in fact, can be bent until it is broken, and the thin coating will still cling together.

Automatic machines do most of the nylon coating. Rolls of wire are started in at one end. They pass through nozzles which spread the nylon on evenly, then through a furnace which dries the material to a hard finish. Although several coats are applied, the final result is a reliable insulator that is only 7/10,000ths of an inch thick. *From GM Folks, Sept. 1949, a publication of General Motors Corporation, Detroit 2, Michigan.*

## Hardfacing Paddles Increases Their Work-Life

ONE OF THE most recent cost and time savers introduced in the concrete pipe industry is the application of hardfacing alloys to feeder paddles.

In the manufacture of concrete pipe, the concrete mixture is placed in a hopper, fed into a chute and from there it goes into the pipe mold. The rotating feeder paddles, which are located at the bottom of the hopper, serve to feed the mixture into the chute.

The abrasion of the "dry mix" concrete under pressure between the tip of the paddle and the bottom of the hopper causes a wearing of the paddles. As wear progresses, the rate of concrete feed flow into the mold is lessened, decreasing the efficiency of the unit.

Before hardfacing became a part of the preventive maintenance program, the life of the semi-steel feeder paddles was about 80 hours, after which time the paddles were replaced. Today, after an application of the hardfacing, a test set of eleven feeder paddles has been in service for over 800 hours.

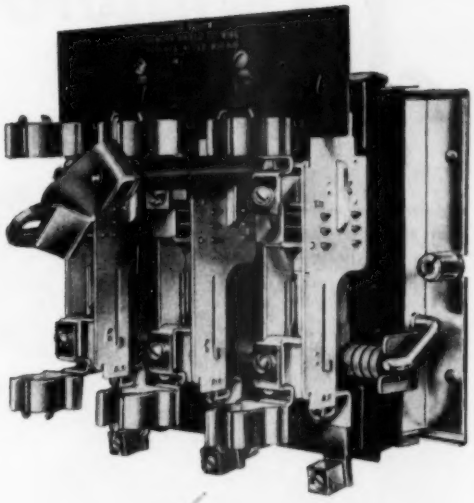
One-half hour devoted to preventive

*(Continued on page 32)*

# NOW...an ALL-NEW Type A Safety Switch for modern high-capacity distribution systems...

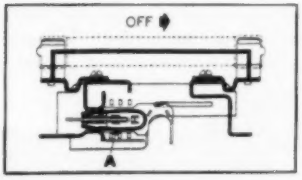
## TRUMBULL'S HCI

**HIGH CAPACITY INTERRUPTER**

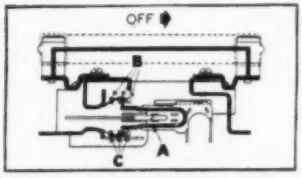


Unusually high interrupting capacity..."circuit-breaker" action breaks heavy loads quickly, safely. Extremely high momentary current capacity . . . withstands heavy short circuits without damage. 30-, 60-, 100-ampere sizes.

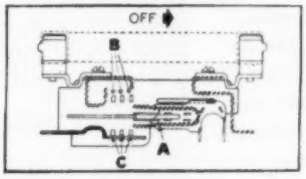
### *Here's How...*
### HCI's "Circuit-Breaker" Action Works




**1.** Switch closed. Spring-loaded sliding contact (A) fully inserted between stationary contacts. Heavy line is current.




**2.** Sliding contact being withdrawn. The two arcs repel each other, are drawn against grid pins (B) and (C), which break and cool them.




**3.** Contact fully withdrawn. Trumbull's unique "Circuit-Breaker" action has effectively extinguished the arcs.

### CHECK THESE ADDITIONAL SPACE-SAVING, TROUBLE-PREVENTING, LIFE-LENGTHENING FEATURES

Center-front operation permits close ganging.

Front fusing allows compact box, yet gives ample wiring space.

No exposed live parts when switch is OFF and door is open.

Handle interlock.

Clear ON and OFF markings both inside and outside.

No dead center—roller-cam action (multiplying linkage design with powerful spring) throws switch to full OFF and ON.

Poles are self-contained switching units for easy replacement.

Silver-plated current-carrying parts prevent oxidation . . . give low-resistance contact.

Insulating parts made of linen melamene, light, strong, arc-resisting.

Enclosed operating mechanism (on 60- and 100-amp. sizes) prevents wire chafing.

Interior removable for wiring ease.

*Underwriters' approval throughout.*

For more information about Trumbull's all-new HCI Safety Switch, write for your free copy of Bulletin TEC-10 today. THE TRUMBULL ELECTRIC MANUFACTURING COMPANY, Plainville, Connecticut.

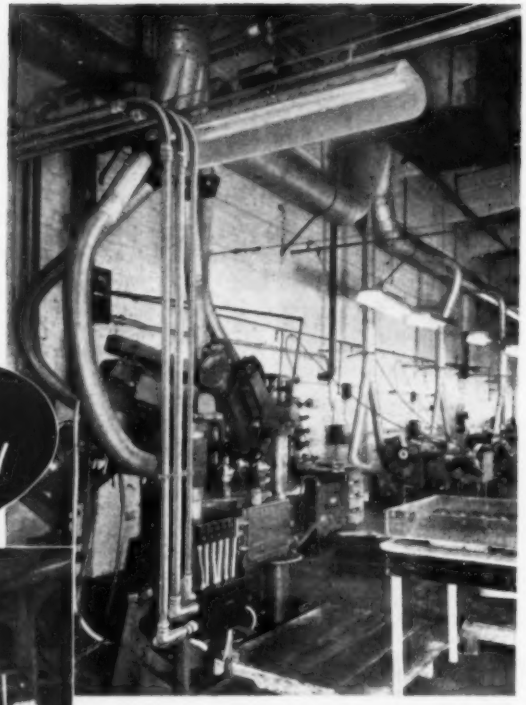
***Men Who Observe the Best Electrical Practice Make It a Practice to Use***

**TRUMBULL (T) ELECTRIC**

**TRUMBULL'S TRAINLOAD OF NEW PRODUCTS**

# 3 Problems— 1 Solution

## ... KIRK & BLUM!



Below: High velocity, double-slot hoods effectively pick up fumes as formed, remove sistant piping and exhausters.

**Polishing Buffing Dust Control**

**Plating Fume Removal**

Above: Dust Collecting System; note flexible connections permitting movement of automatic buffing and polishing machine. Below: Two-pass monorail conveyor through direct fired gas oven.

**Enamel Baking Conveyor Oven**

Illustrating Kirk and Blum's wide experience and money-saving ingenuity are these installations in the plant of a large auto accessories manufacturer. Three separate systems eliminate fumes from pickling and plating tanks, control dust in polishing and buffing operations and provide accurately controlled heat for enamel baking in a conveyorized overhead oven.

These are examples of the hundreds of systems designed, fabricated and installed by KIRK & BLUM. Turn your dust control, fume removal or low temperature oven problems over to experts with 40 years' experience.

**DUST AND FUME CONTROL SYSTEMS**

**INDUSTRIAL OVENS**

**KIRK AND BLUM**

**THE KIRK AND BLUM MANUFACTURING CO., 2889 Spring Grove Ave., Cincinnati 25, Ohio**

# Bulletins on Current Plant Problems

## ELECTRICAL

**101 Synchronous Motors** — Publication GEA-5426, 8 pp, lists some of the applications for manufacturer's high-speed synchronous motors. Illustrated with many photos, the bulletin gives three typical installation stories, describes protection, and discusses construction features, mechanical modifications, and direct-connected exciters for the motors. Covers two- and three-phase type motors in ratings from 30 to 1500 hp at 60 cycle speed of 1800 rpm, as well as proportional hp ratings for speeds through 514 rpm. General Electric Co.

**102 Unit Substations** — Booklet B-4230 describing ignitron unit substations for providing a source of d-c power near the load, discusses component parts of these substations. Company's dry-type transformers are described to show how use of no liquid makes it possible to mount entire unit anywhere without fire or explosion hazard. Metal-enclosed switchgear for both a-c and d-c portions of substation are also described. Sealed-type ignitron rectifier equipment is explained and comparison data provided to show operating efficiency at both full and low loads. Westinghouse Electric Corp.

**103 Flexible Terminal Blocks**—This bulletin provides test results, physical and electrical specifications and dimensional data on an easily-used system of interlocking units that may be added to terminal blocks in any number at any time. Includes prices of points, end pieces, marking strips and cover pieces. Wama Co.

**104 High Speed Synchronous Generators** —Bulletin GEA 5415 deals with generators for standby, portable and prime source power in wide-spread fields of application. Profusely illustrated, it gives three typical installation stories, describes protection afforded, and tells about construction features, mechanical modifications, and performance data. General Electric Co.

**105 Small Electric Generating Plants**—Form A-168H covers a line of gasoline-driven electric plants for institutions, construction projects, standby service and other applications. Those described and illustrated range from 260 to 35,000 w in standard voltages, frequencies and phases. Also listed are battery charging electric plants in 6, 12 and 32 v, 400 to 2000 w, and special accessories. A general information section gives selection pointers. D. W. Onan & Sons, Inc.

**106 Charge Control Unit**—Bulletin 201 describes and illustrates an accessory for automatically charging two batteries from company's single-circuit motor generator battery charger. Tells what the unit is, how it works and what its advantages are. The Hertner Electric Co.

**107 Safety Switches** — Folder TEC 10, gives information about company's high capacity interrupter safety switches for use in industrial distribution systems. A detailed explanation of the arc-quenching action of the grid pin design is illustrated by several schematic drawings. Other features described include center-front operation, front fusing, and a roller-cam action and special linkage design. The Trumbull Electric Mfg. Co.

## MATERIALS HANDLING

**108 Electric Fork Trucks**—Besides providing specifications and dimensions on four models of electric fork trucks, Bulletin 25 contains 16 pictures of these trucks at work and explains and illustrates how they operate in limited space, save time, afford increased safety. Also discusses some of their engineering features and describes and pictures special purpose attachments, storage batteries and chargers. Lewis-Shepard Products Inc.

**109 Roller Chain Assembly** — Bulletin 50-6 illustrates and describes a riveted roller chain assembly consisting of a standard riveted chain with a single-pin connecting link at the 2-ft mark and at the end of each basic 5-ft length in which chain is assembled. Tables and examples are provided showing suggested combinations of these units for various drive lengths. Also included are construction diagrams, illustrations, list prices, specifications and dimensions. Baldwin-Duckworth Div., Chain Belt Co.

**110 Sectional Conveyors** — Bulletin 123 gives an illustrated description of company's recently-introduced sectional conveyor which consists of a head or drive section, tail section and any number of intermediate truss sections. Text covers assembly and use of parts. Bulletin also describes and illustrates vibrating screens. Hewitt-Robins Inc.

**111 Portable Elevating Table** — Bulletin P-50, describing and illustrating a height-adjustable table-work bench, presents a solution to problems of lifting and transporting heavy tools or materials. Contains photos of the table in use and full specifications. Also describes special equipment for standard units and includes pictures of special models for special jobs. The Hamilton Tool Co.

**112 Job Study on Bottled Goods Handling**—Outlined in detail in Job Study 98 are handling methods which brought savings to a manufacturer of bottled household cleaners. Photos shows the handling system that made it possible for one man to handle 1200 cases of bottled goods an hour without breakage, and other examples of increased efficiency in handling credited to palletising, use of motor truck and unloading accessory. Towmotor Corp.

**113 Efficient Cartoning** — This booklet stresses speed and labor-saving qualities of a constant motion vertical cartoner. Its operational sequence is explained and illustrated, as are precalibrated settings and adjustments possible, mechanical and electrical features. Includes floor plan and specifications, suggestions for use. R. A. Jones & Co., Inc.

## INSTRUMENTS AND CONTROLS

**114 Time Cycle Controllers** — Bulletin 98154 features an instrument adaptable to applications which have a multiplicity of functions to perform during the course of a cycle. Describes five models for applications requiring all-electric or all pneumatic operation or combinations of each, showing how they control a group of functions required in the sequence of a manufacturing operation according to a predetermined schedule and over a timed period. Photos of complete instruments, sectional views and application drawings included. Taylor Instrument Companies.

**115 Viscosity Control Unit**—Data Sheet 012 is devoted to an instrument unit which can be engineered into production systems to provide continuous and automatic viscosity control. Illustrates and describes some typical installations. Explains construction and operating details, discusses major features. Brookfield Engineering Laboratories, Inc.

**116 Thermometers and Controls** — Comprehensive Catalog 110, 64 pp, covers company's line of thermometers designed for a wide range of temperature measurement applications, also special testing thermometers, gages, psychrometers and hygrometers as well as thermostatic relays and other controls, fittings and accessories. Instruments are illustrated by photos and listed with full ordering data. Book is indexed and includes price list, temperature conversion tables. The Philadelphia Thermometer Co.

**117 Counters** — Bulletin 3140 describes and illustrates company's line of heavy duty counters. Twenty models are listed—standard tripped types, motor-driven types, ticket printing types, automatic stopping counters and explosion proof units. Elaborates on ticket-printing units which issue printed record with carbon copy. Richardson Scale Co.

**118 Hydraulic Weighing Systems** — Bulletin 303, 20 pp, describes and illustrates portable hydraulic weighing system components for varied applications in industrial plants and testing laboratories. Covers hydraulic cells from 100 to 100,000 lb capacity for compression and tension loads, and crane scales and portable cells with integral Emery bourdon type indicators, also two types of separate indicators, as well as hydraulic lifting jacks and hand pumps for use with compression type load cells. Text explains general principles of operation and features of equipment and includes dimensional drawings. Testing Equipment Dept., The Baldwin Locomotive Works.

**119 Shock-Resisting Meters** — A line of electrical indicating instruments which are

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March, 1950
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**PLANT ENGINEERING**

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hermetically sealed and specially built to resist shock are described and illustrated in detail in this booklet. Discusses the meters' shock mount development, frame structure, fastening methods used, springs and other design details. Also pictures testing methods used in development of these meters. Marion Electrical Instrument Co.

**120 Thermometers**—Recording and indicating thermometers for general industrial applications, as well as special refrigeration thermometers, are illustrated and described in Form G 142. Bulb specifications, chart ranges and other data covering all models are presented. Bulletin is accompanied by illustrated folder of operating instructions and separate price list. The Electric Auto-Lite Co.

**121 Flow Gage**—Catalog 98 introduces company's low cost, flow rate indicator for coolants, lubricants, opaque liquids, slurries and other fluids. Tells how gage is used where it's applicable. Includes photo and sectional drawing of instrument, discussion of its design, and full dimensions, specifications, and flow rate and pressure data. Fischer & Porter Co.

**122 Chlorine Dispensers**—Catalog 61 describes company's line of chlorine dispensers including self-contained cabinet-type units with capacities ranging from 1 to 1200 lb of chlorine per day, and systems with unlimited dispensing capacity which have same design and safety features. Fischer & Porter Co.

**123 Mechanical Pressure Gage**—Dimensional data, general specifications and prices on a mechanical pressure indicating instrument are provided in this bulletin. Illustrated with photos of the gage and some of its many industrial uses. W. C. Dillon & Co., Inc.

**124 Ground Detector**—How company's ground detector works and why it is recommended in the prevention of unnecessary destruction of equipment and plant shutdowns are explained in this illustrated folder. Describes and pictures instrument's generator and control panel and shows signal receiver in use. Includes specifications and ordering data. Excel Electric Service Co.

## FANS, BLOWERS

**125 Blower Data**—Specifications, capacities, dimensions and prices on blowers are provided in Publication 88. Also includes performance chart on a 1750 rpm blower. The Standard Stoker Co., Inc.

**126 Fans, Unit Heaters**—Ordering information and engineering data on direct-connected centrifugal fans and self-cooled motor propellor fans, self-cooled motor unit heaters, and light-duty electric ventilators are provided in Bulletin 8-200. Illustrated with photos, dimensional drawings. Ilg Electric Ventilating Co.

**127 Corrosion Resisting Fans**—Photos, specifications and dimensions of six models of fans for the removal of corrosive fumes are presented in Bulletin 1102. Describes construction details and available alloys and lists typical applications. Also covers motors for fans, drive units, outlets and other accessories. Tells how to specify, order and select correct size of fan. The Duriron Co., Inc.

**128 Air Diffusers**—Bulletin K-34 presents air diffusing units for use in acoustical ceilings. Illustrated with photo of diffuser, drawings showing assembly details and method of installation. Dimensions given. W. B. Connor Engineering Corp.

**129 Automatic Hand Dryer — How a** small, wall-mounted electric hand dryer gets hands dry in 20 sec is told in this illustrated bulletin, which also explains how it can increase washroom efficiency. Lists special features of dryer, emphasizing reduced maintenance. National Dryer Corp.

## FLOORS, FLOORING

**130 Emulsions for Mastic Floors**—This helpful booklet on heavy-duty asphalt mastic flooring and floors tells how mastic floors are laid and what their advantages are. Gives specifications for heavy-duty industrial applications, discusses preparation of the flooring, priming, hand-finished and power-floated application, and includes mixture recommendations and coverages. Also covers patching and resurfacing and use of mastic as underlayment for decorative floor covering. The Flintkote Co.

**131 Asphalt Mastic Flooring**—The acid-resisting, waterproof, non-skid and long wearing qualities of company's asphalt mastic floors are presented in this catalog. Full information on these floors, their economy and quick installation, are provided, together with specifications. Also describes several industrial floorings for special conditions, an acid-resistant brick and brick jointing compounds. Typical installations are illustrated. Ralph V. Bulon, Inc.

**132 Light from Floors**—This 24-pp booklet promotes use of white cement for light-reflecting floors. Tells reasons why white floors afford better illumination, explains the economy of white concrete, and includes a case study of an installation. Gives illustrated instructions for installation and maintenance of these floors. Photos show interiors of several industrial plants where white concrete floors are used. Universal Atlas Cement Co.

**133 Service Floor Surfacings**—Form 77 covers three floor surfacing materials designed for special industrial flooring requirements, and also a concrete floor patching material. Discusses their applications and performance under special conditions. United Laboratories, Inc.

**134 Industrial Maintenance Material**—This handy bulletin presents brief descriptions of approximately 40 of manufacturer's floor and roof coatings, exterior, interior and special finishes, telling how to use them and where. Includes prices and coverages of most of the coatings. The Pioneer Chemical & Mfg. Co.

## STEAM GENERATING

**135 Bent Tube Boiler Data**—This 20-pp booklet is filled with engineering drawings of recent installation of company's Class VL boilers, designed for adaptation to limited space conditions in plants having diverse steam requirements. Text covers main design features of these bent tube boilers. Henry Vogt Machine Co.

**136 Steam Boilers**—Form SG 128-740 is a four-color catalog illustrated with photos of steam boilers for processing and heating, ranging from 15 to 500 hp and 15 to 200 psi. Includes a diagrammatic cross-section showing the four pass design characteristic of manufacturer's boilers. Stresses advantages of these boilers. Cleaver-Brooks Co.

**137 Steam Generator**—A packaged automatic generator for low or high-pressure steam or hot water, using natural or manufactured gas, is presented in Bulletin ID-49-43. Includes capacities, dimensions, brief discussion of major features, photos of several installations accompanied by testimonials. York-Shipley, Inc.

**138 Steam Generators**—The economy, efficiency, compactness and accessibility of company's automatic steam generators are discussed in illustrated Bulletin G-401. Also explains operation of the generator and lists standard equipment for all models and special burner equipment for firing with light and heavy oils and gas. Includes specifications, dimensions. Edge Moor Iron Works, Inc.

**139 Steel Boilers**—Catalog 89-S is on company's "square-heat" type boilers designed for heating medium size plants and built for oil, gas, or stoker or hand-fired coal. Illustrates boilers and jackets, gives dimensions and specifications and explains advantages of the line. Kewanee Boiler Corp.

## CLEANING EQUIPMENT

**140 Mechanical Floor Sweeper**—A hand operated industrial floor sweeper designed to collect dust as it sweeps, is described in this folder. Illustrated with photos and sketches, it explains how a rotating brush attachment permits cleaning up to walls, elaborates on economy, safety, and efficiency of the unit. Gives specifications and prices for both 42-lb and 60-lb models. Handling Devices Co., Inc.

**141 Heavy Duty Cleaner**—Illustrated Form 130 describes a heavy-duty vacuum cleaner for all-around industrial use on floors, walls, bins, ceilings, pipes and designed for recovery of either dry or wet materials. Includes operating data and specifications. Doyle Vacuum Cleaner Co.

**142 Cleaning Machines**—Publication BT-1R describes briefly and pictures basic suction and scrubbing machines for wet or dry industrial cleaning jobs, telling what each type is equipped to do. The Kent Co., Inc.

**143 Steam Cleaner**—Form SUP 100 features a high-speed, high-pressure cleaning unit for heavy-duty cleaning jobs which also operates as a process heat generator. Includes pictures and dimensions of trailer mounted, portable, and stationary models, giving specifications for each; also lists optional equipment. Eighteen features of the unit are discussed separately. Hypressure Jenny Div., Homestead Valve Mfg. Co.

*(Continued on page 79)*

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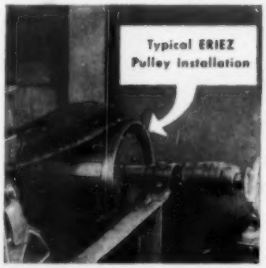
# 1950 Eriez Magnetic Pulleys up to 50% Stronger




Completely redesigned and vastly improved magnetic pulleys are now being offered by the Eriez Manufacturing Company for the effective separation of ferrous from non-ferrous material. These permanent non-electric separators are completely automatic in operation. They serve to remove tramp iron from materials being processed in the chemical, food, metalworking, textile, milling, ceramic, tobacco and many other industries.

The new 1950 Eriez pulleys are more rugged than ever . . . with absolutely uniform end-to-end flux distribution that means more dependable iron removal. Added to this, magnetic strengths have been increased up to 50% in some models.

Total weight of the pulleys has been reduced . . . structural strengths increased. The assembly has less dead metal and more useful magnet weight. Available in 12", 15", 18", 20" sizes. To learn more about the new Eriez line of pulleys, circle No. 1 in coupon and mail to Eriez.

## PHILIP MORRIS PRODUCT PURITY GUARDED BY ERIEZ MAGNETS

Philip Morris & Co., Ltd., Inc., spares no expense to be sure that its increasingly popular cigarette is delivered clean and perfect to the user.

A. C. Britton, General Manager of the Philip Morris factory at Richmond, says, "We

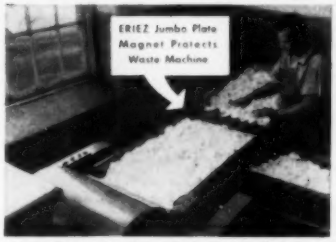
subject our tobacco and our cigarettes to three major tests for purity of material and perfection of product. First, the tobacco itself passes through an electronic metal detector to note the presence of metal, which is then removed by hand. Then, the finished cigarettes pass under a magnet which removes any iron contamination. Finally, the complete packages pass before a combination electrical-mechanical detector which discards any package containing an imperfect cigarette."

Philip Morris engineers working on the second phase of this protective procedure, tested as many as 16 different types of permanent magnets before the Eriez permanent magnet was determined best for the purpose. The special plate type magnet now in use operates on all cigarette-making machines. For more data on plate magnet applications, circle No. 4 in coupon and mail.

## MAGNETS FOR WASTE MACHINES CUT TEXTILE FIRE HAZARD

In South Carolina recently, a nail went through a waste machine in a big mill. Result: FIRE — DAMAGE — DOLLARS LOST.

The superintendent of the mill said the tramp




iron problem had to be solved. Eriez engineers did it, even though the matted texture of waste had brought failure in earlier attempts to remove metal magnetically.

The installation includes an Eriez 20" Jumbo plate magnet, one of the most powerful in the Eriez line of plate, hump and pulley magnets for textile mills. After demonstration of the separator's efficiency, seven additional installations were ordered for other mills.

For data on Eriez permanent magnetic separators for textile applications, circle No. 3 in coupon and mail.

## NEW CATALOG DESCRIBES ALL ERIEZ PRODUCTS

The complete line of Eriez non-electric magnetic separators and electronic metal detectors is fully described in a new 12-page, two-color catalog.

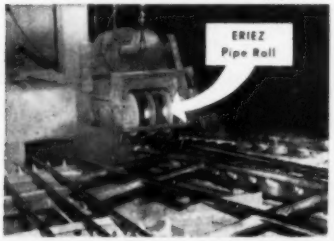
Included are plate type separators for gravity flow chutes, hoppers, and other stationary installations; magnetic humps for pneumatic lines and some gravity flow-drops; non-electric pulleys and drums for belt conveyor lines; magnetic pipeline traps for liquid flow applications; road and floor sweepers; piperolls; and an electronic detector for all metals.

Full specifications, photographs and engineering drawings accompany each piece of equipment. To obtain catalog, circle No. 2 on coupon and mail.

## STEEL COMPANY SAVES MONEY USING MAGNETIC PIPE ROLLS

Utilizing double drag-out Eriez permanent magnetic pipe rolls to convey pipe from hot galvanizing baths, Wheatland Tube Company, Wheatland, Pa., is realizing tremendous savings each year.

Eriez non-electric rolls move the pipe in a




double line up an inclined plane from the tank, allowing much more zinc than usual to drain back into the galvanizing bath. This, plus decreased maintenance and power consumption, saves thousands of dollars annually. Wheatland is greatly impressed with the magnetic rolls' operation and highly recommends their use.

Eriez pipe rolls are completely non-electric; burnouts and maintenance problems caused by high temperature, corrosive fumes and steam are minimized, resulting in greatest possible economies.

For more data on Eriez Pipe and Shape Rolls, circle number 5 on the coupon and mail.

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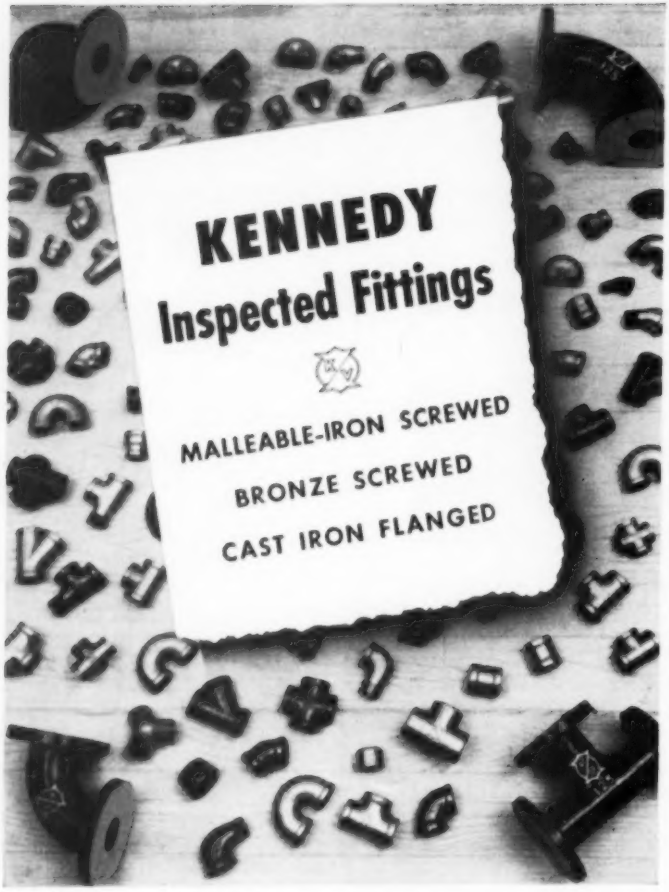


**MALLEABLES.** Tough close-grained iron, black or galvanized, precision threaded with generous chamfer for easy pipe entrance. Constantly checked for alignment and depth of thread . . . individually inspected to insure high quality. Hot-dip galvanized for a thoroughly bonded, heavy coating of uniform thickness. High safety factor in service rating.

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## *Plant Engineers' Digest*

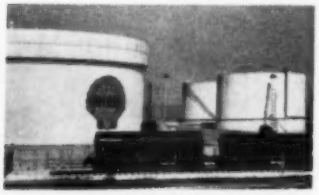
*(Continued from page 26)*

maintenance in the form of hardfacing increased the work-life of these parts more than ten times. *From Airco in the News, Vol. 9, No. 4, a publication of Air Reduction, New York 17, N. Y.*

### Handling Petroleum Products Safer and Faster

A RECENT petroleum terminal has been built to handle petroleum products faster, safer and at less expense than ever before.

A special feature is that of the big-bellied cylinder that looks like a hat-box with an oversized lid. It is the 67,000 bbl tank reserved for gasoline. That lid is an expansion roof, so designed that it can slide up a full ten feet above the tank's top rim. The purpose: to save quantities of gasoline



**The expansion tank that saves vapors. Note the tankcar siding and space-saving concrete dike at foot of tank**

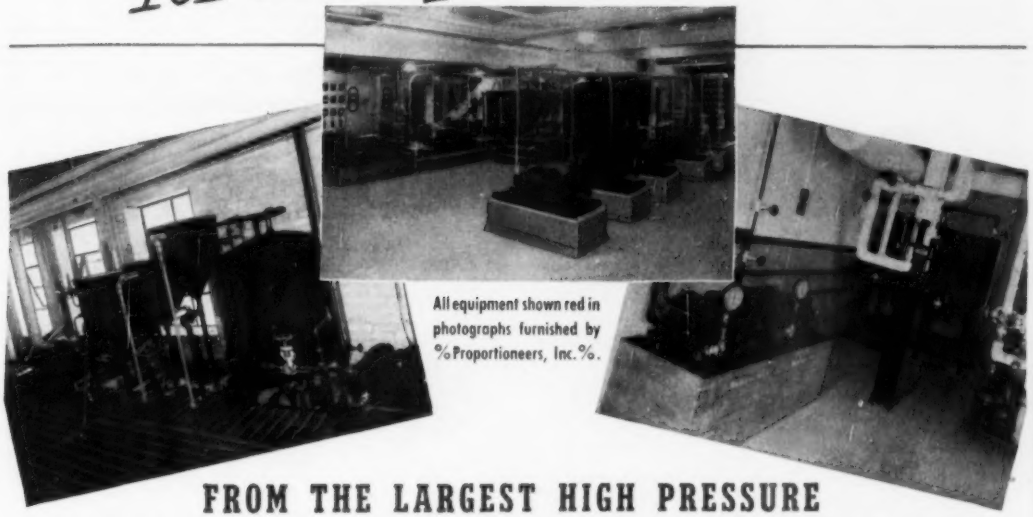
**Motor oils run through meter from storage tanks into drums which are moved along on conveyors. Special oils are blended in heated tank at upper right**

that would otherwise be lost in exhaust vapors. The lid is what does it.

It works this way: two other gasoline tanks of 20,000 bbl capacity each are connected to the big tank by vapor lines. When high temperatures turn some of the product into vapor, increased pressures drive the gas into the big tank. As the pressure in there increases beyond a certain point, the

**CHEMICAL TREATMENT METERING PUMPS**

# *for Every Power Plant*



All equipment shown red in photographs furnished by %Proportioneers, Inc.%.

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roof lifts to allow more space in the tank; and the vapor is saved until lower temperatures turn it back into the original product.

Another feature is that every major product tank is surrounded by concrete dike walls a foot thick, not quite seven feet high. If any tank burst or sprang a leak, the surrounding walls would hold all of the product it had stored. *From an article by John Perkins in Shell Progress, a publication of the Shell Oil Co., Inc., New York 20, N. Y.*

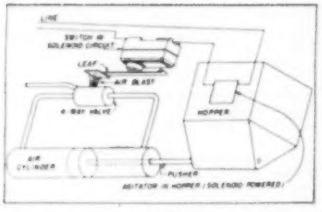
## New Vinyl Insulation for Oil Immersed Power Transformers

Hot oil has never been kind to organic electrical insulating materials. It stiffens and shrinks most insulation, thus necessitating frequent overhauling of electrical equipment in contact with hot oil.

A special tubing extruded from Vinylite resins is used as insulation for an oil immersed type power transformer. It is used to cover the leads of transformers. The special tubing was tested for this application—along with tubing extruded from a number of other electrical insulating materials—by immersing vinyl covered leads in transformer oil for sixty days with the temperature maintained at 230 F. No evidence of cracking, stiffening, or shrinking was found in the tubing extruded from Vinylite resins.

In addition to oil and heat resistance as well as a uniform, solid wall, the plastic tubing possesses the advantages of low initial cost, high dielectric strength and great flexibility. *From Bakelite Review, Oct., 1949, a publication of Bakelite Corporation, New York 17, N. Y.*

## Air Blast Actuates Snap-Action Switch




**Following idea is for agitating a hopper from which an air cylinder automatically feeds drill blanks. The air cylinder is controlled by a 4-way air valve. When properly located dogs cause the reversal of the air valve, a short blast of exhaust air from the valve strikes a hinged metal vane with sufficient force to operate a snap-action switch. The switch in turn operates a solenoid mounted on the hopper which provides the necessary mechanical agitation, and which has spring-gravity return. Operation is independent of the speed and length of the stroke of the air cylinder. (From an article by E. J. Hills in Micro Tips, Vol. 1, No. 5, a publication of Micro Switch, Freeport, Illinois.)**

# R & M CRANES GIVE WINGS to Boiler Company Steel

In the huge Huntington Boiler and Supply Company, loads of steel are constantly on the move. For fast, efficient, safe handling, these people use one 10-ton and two 5-ton Robbins & Myers electric overhead traveling cranes. From cars to storage, storage to work area, these R & M "giants" speed daily production schedules, help create a better profit picture.

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# Making 1 maintenance dollar do the work of 7

A large Eastern gas manufacturer formerly relied on ordinary high-temperature paints to protect 15,000 square feet of surface on generators, carburetors, superheaters, cross-over and take-off line and boiler stack. At the most, a coating lasted 30 days before peeling. The *monthly maintenance cost*, for material alone, was *$105*.

Then Koppers Bitumastic ® Hi-Heat Gray was given the job. In spite of intermittent temperatures 300° higher than recommended limits for Hi-Heat Gray, the original application of Bitumastic is in excellent condition after more than a year. Material cost was $228—a *monthly cost* of $15 based on service to date.

These 7-to-1 savings are just on materials. Add on the cost of labor —2½ to 4 times the material cost—and you'll find the total savings are tremendous.

## CORROSION PREVENTION IS OUR BUSINESS

Koppers handles the entire job of protecting industrial plants against corrosion. Here are the steps we take to keep industry's No. 1 enemy under control:

SURVEY—Corrosion experts will survey your plant and determine where protection is needed . . . how much protection is needed.

MATERIALS—Koppers offers a complete family of Bitumastic Protective Coatings . . . materials for every job of corrosion prevention.

APPLICATION—Trained applicators are available to make certain that Bitumastic Protective Coatings are put on correctly to give maximum service.

***Write today*** for complete information on Koppers corrosion prevention service. Remember: 50 to 90 per cent of maintenance and replacement costs are chargeable directly to corrosion!

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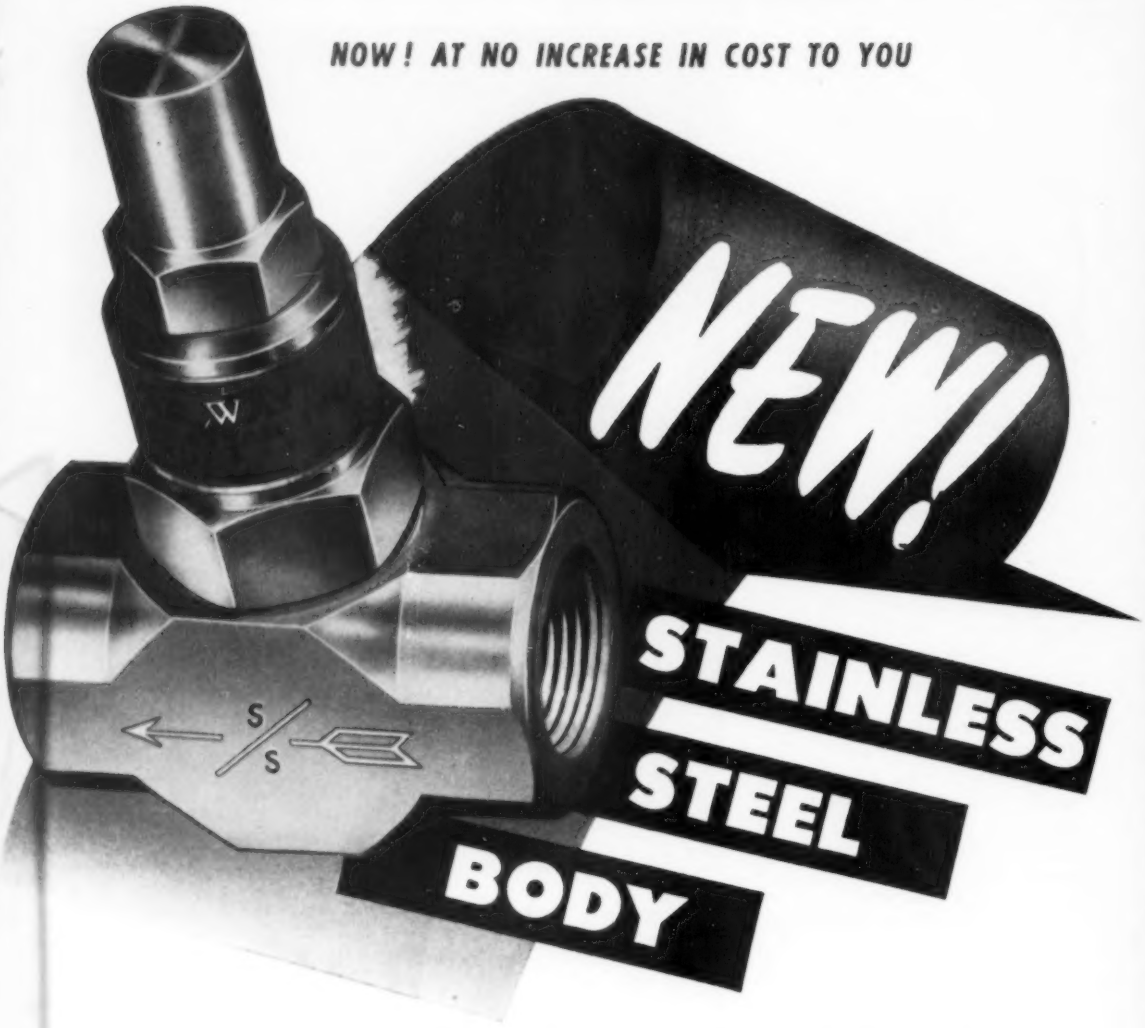


## *Makes a good steam trap better*

Nearly 650,000 Yarway Impulse Steam Traps have already been installed—proof that they are doing a good job.

Now a *stainless steel* body makes this famous little trap even *better—at no increase in cost.*

Better in *wear*, better in *service*. Users will find Yarways require less maintenance than ever. All parts are wear-resistant, practically wear-proof. There is only one moving part, a small, stainless steel, heat-treated valve. Important, too—Yarway Impulse Traps are *suitable for all pressures up to specified maximum without change of valve or seat.*

Other popular advantages are *small size, light weight, easy installation* and *low cost.* Often it costs *less* to buy a new Yarway trap than to repair an old, ordinary trap.

In performance—ask any user. They all say Yarways are the traps that *get equipment hotter sooner and keep it hot!*

For better steam trap performance, try *new* stainless steel Yarways.

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**YARWAY IMPULSE STEAM TRAP**

# Choosing An Industrial Lighting System

By J. L. TUGMAN, Engineering Div., NELA Park, General Electric Co.

*The material on the next four pages offers an introduction to the important subject of industrial lighting. Since the information is presented largely in pictorial form, with brief explanatory captions, the essentials pertinent to a choice of systems are easy to grasp. E. A. Linsday, industrial lighting specialist of the Engineering Division of the General Electric Lamp Department, selected the examples. The sketch illustrations, developed by Martha Lauderbaugh, staff artist, follow closely the data supplied by Mr. Linsday's studies.*

INDUSTRIAL LIGHTING is, of course, a very broad subject, which cannot be adequately comprehended in an introductory article. However, since few plant engineers or superintendents have the time or opportunity to pursue the full implications of this subject, this article has been designed to give them an approach to the large initial questions. Every plant engineer knows he must have a system of general illumination as a condition precedent to operating his plant. He may be very much aware of the most obvious inadequacies of an existing system. Thus, whether his problem is the improvement of his present equipment, or a decision about a brand new installation, he may be at a loss to know how to size up his general requirements. He knows from his experience that there are many ways to light industrial space. He may have a variety of space problems and he may be wondering how he should prepare his own ideas before calling in a specialist. The expert can help him much better if he has first made a careful appraisal of his needs.

For instance, if he has high bay areas that have been giving him trouble, it may help him to note that the selected examples suggest three different systems, each with special distinguishing features, for this type of space. As he checks each high bay system he will probably find the particular combination of features which he believes are best suited to his plant. He will know pretty quickly which system will best satisfy his requirements with reference to level of illumination and to capacity of his wiring, and which system will permit a maintenance plan best suited to his operations. The practical benefits of one or another of the systems can be weighed against the important discussions of initial versus overall costs, and just what the budget will permit. Having first studied the options, the plant engineer will certainly have discovered that the true economy for lighting industrial space is the long run contribution a system can make. This is true for choices of lighting plans made for all types of industrial space, high or low bay.

Flexibility is emphasized in factors affecting the choice of an industrial lighting system. That is to say that since operations vary from one plant area to another, from day shift to night shift, (even from hour to hour) and from one season's production problems to another (someone else may buy the plant), a single static lighting plan may be a serious handicap. Thus, the flexibility of the system of 300-watt R40 lamps (No. 1) which permits two or three lamps to be operated on one circuit, or the broken row scheme of fluorescent lighting which anticipates a full continuous row system at a later date, (No. 2), or the combinations of mercury and filament lighting (No. 5 and No. 3), which suggests how the matter of color quality may be adapted to particular plant requirements: all these represent aspects of the many-sided factor of flexibility.

The plant engineer may have given a lot of thought to the areas where skilled workmen are busy every working hour with problems calling for constant, accurate judgement about visual tasks. He may understand the general principle that seeing is easier when there is more light on the task. He may have wrestled with the baffling problem of satisfying the needs of individual workers and running into offsetting difficulties with respect to other plant personnel. (A common problem occurs with windows. Workers in one part of the plant may find unshaded windows intolerably bright, while others object to shading them. Analogous situations develop with respect to improperly shielded lighting equipment.)

Excellent quality illumination at high levels, such as the grid system described in No. 6, depends upon the care exercised in conditioning the surrounding environment. Quantity of footcandles alone is only one part of the successful application of high illumination levels. Another very important part is the care taken with the color and type of finishes used in all the room surfaces. Color appearance alters with different levels of illumination, and is further influenced by the combination of colors present. For shops where the highest skills are working on the most exacting visual tasks, the choice of good color combinations in mat finishes, plays a significant role in determining worker comfort and the success of a lighting system.

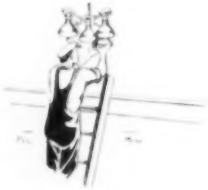
All the foregoing relates to general lighting systems, that is the overall foundation facility for seeing. These are the provisions that precede consideration of special, local problems. To call attention to these specific problems Mr. Linsday has selected several instances of inspection operations which require a special type of lighting solution. Whereas general lighting solutions must depend upon providing a facility to serve a variety of workers and tasks with a uniform adequacy of environment, localized lighting must be designed for the work of a single individual or, possibly a small group. It supplies factors of intensity, direction, color quality, etc., expressly for given jobs and often with reference to eyesight trained and sensitive to specialized problems.

# CHOOSING AN INDUSTRIAL

Prepared by J. L. Tugman on the basis of technical data selected by E. A. Linsday . . . Sketches by

## SYSTEM NO. 1

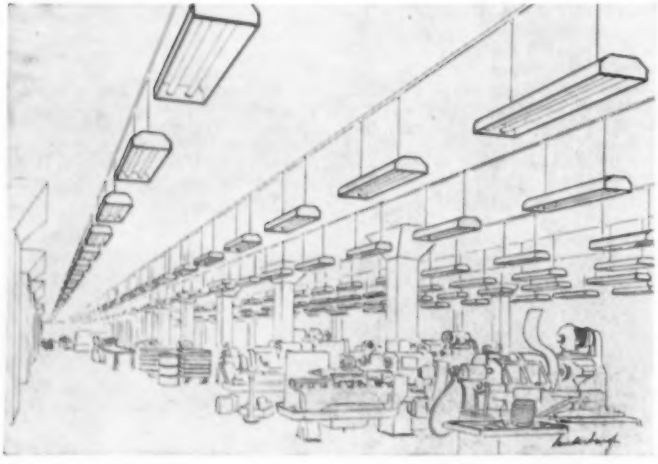
Foundry operations generally create a great deal of dust and oily condensates which complicate the problems of providing good lighting. Wastes in the air not only impede the transmission of light, but they also directly affect the production of light as they accumulate on the equipment. Keeping lighting equipment clean enough to be serviceable used to be a great problem in foundries. Since much foundry work is done in high bay areas, and since the working space on the floor is intensively used in operations, lighting maintenance is usually an urgent necessity that must often be dangerously postponed. The danger lies in the increase in industrial accident hazards. A few years ago industrial lighting engineers offered foundries and other heavy industries a new system. It consists of a cluster of filament reflector lamps. The clusters usually comprise five lamps, circuited so that groups of two or three can be turned off when the plant is not in full operation. The chief virtue of the reflector lamps is that so little dirt collects on the light emitting surface. Dirt accumulation will not reduce output by more than 20 per cent. Clusters spaced on 17 by 20 ft centers produce about 30 footcandles in a typical installation using 300-watt R-40 lamps.



## SYSTEM NO. 2

Flexibility in the use of manufacturing plant space can be assisted by a lighting plan which anticipates more intensive future use. Thus, a given plant area may be quickly converted from operations involving only casual seeing tasks calling for medium level illumination to production where most work involves critical seeing tasks requiring higher level lighting. Continuous row fluorescent systems may be developed quickly where the existing system is designed with rows which permit the addition of an extra unit between each pair. In the example illustrated the row spacing for 2-lamp 85-watt units provides a 30 footcandle level. With the addition of an extra unit in each of the row spaces the level could be doubled.

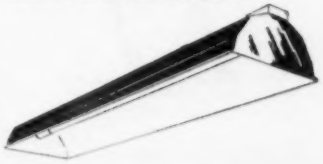
In a large plant area, representing a substantial investment, modern practice calls for facilities permitting quick convertibility. Space may otherwise be turned to less productive uses as shifts in business conditions occur. Considered with respect to the attractiveness of the plant to other manufacturers who might be interested in it as a business property, the flexibility of the lighting plan may be an important asset. All of these factors, together with the necessity of satisfying the needs or peculiarities of highly-paid technicians or mechanics, necessitated careful study of flexible lighting arrangements.



# PLANT LIGHTING SYSTEM

M. Lauderbaugh . . . All of Engineering Division, NELA Park, General Electric Co.

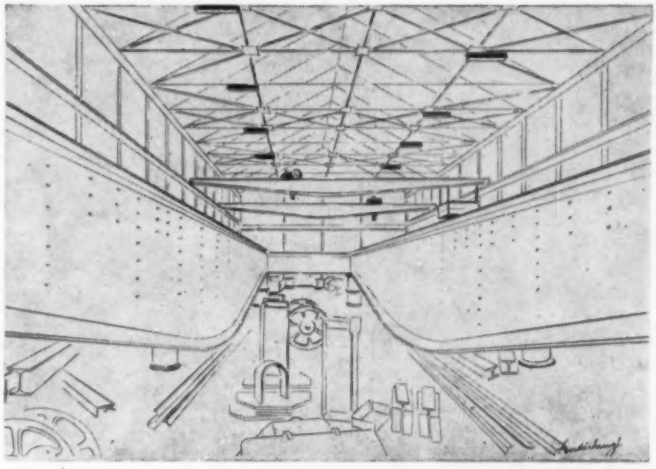
## SYSTEM NO. 3



An excellent solution to many high bay manufacturing areas is provided by installation of 3000-watt mercury units. In foundries and mills, where heavy industry operations are carried on, these powerful and efficient light producers offer a system which can satisfy the primary illumination requirements with modest service requirements. Equipped with hangers they can be kept at high efficiency with maintenance that will not interfere with regular operations.

Where it is expedient to have the lighting equipment mounted at 40 feet or more above the floor, and where the characteristic mercury color is outweighed by the high light output and easy maintenance potentialities, the 3000-watt mercury system is hard to beat. On 35 by 40 ft spacings such a system will deliver about 35 footcandles in service, granted that a regular maintenance program is adopted with reference to the degree of dirt accumulation.

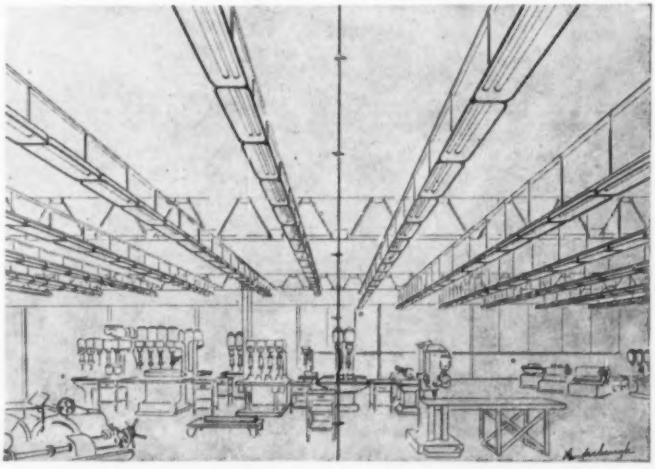
The highly concentrated source makes possible the accommodation of large floor space with relatively few units. One 3000-watt mercury luminaire takes care of as much as 1500 to 1800 sq ft at levels consistent with seeing tasks common to high bay areas in heavy industry. (This source may be used in combination with filament lamps where color quality considerations require it.)



## SYSTEM NO. 4

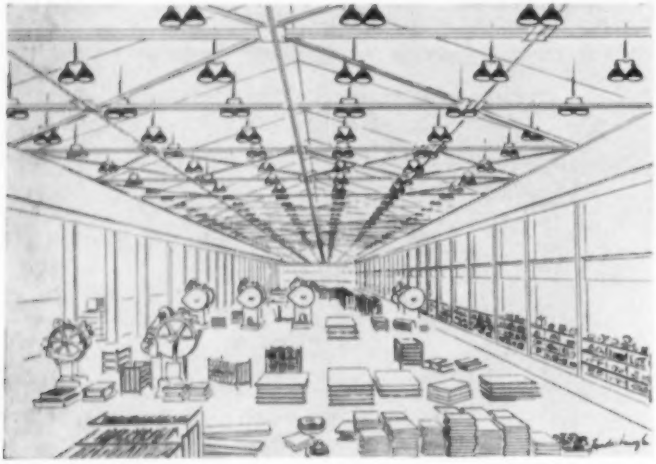
Continuous row fluorescent lighting is available today in two forms which stem from the 40 and the 85-watt lamps. By far the largest number of continuous row systems in use are equipped with 40-watt lamps. This is to be expected since the 85-watt lamp is a relative newcomer. The availability of the higher wattage lamp simplifies the lighting maintenance plan for many industrial areas where fewer fixtures at higher mountings offer an advantage in general plant operations as well as the possibility of lower initial installation expense. Where higher illumination levels are anticipated by the use of 3-lamp vs 2-lamp original installations the 85-watt lamp, of course, makes possible double the increment available with a 40-watt system. At mountings of 17 feet, continuous rows of 2-lamp 85-watt units with rows spaced 10 to 15 feet a level of approximately 50 footcandles will be delivered.

The 40-watt lamp systems still offer solution for many low bay industrial areas. At the lower mountings, and with a regular maintenance schedule, this version of the continuous row scheme satisfies the requirements of superior plant conditions. In systems of 2-lamp units with the rows on 9-foot spacings the 50 footcandles recommended for many industrial operations can be achieved.

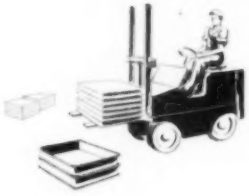


## SYSTEM NO. 5

High level lighting with good color quality is often required from systems which must be located above craneways. For such situations the efficiency of mercury lamps, plus the color quality of filament lamps is frequently the best answer. Combination mercury-filament systems are usually installed with 400-watt mercury lamps in twin concentrating reflectors alternated with 1000-watt filament units in rows. This may be varied by using a single 1000-watt mercury unit instead of the pair of 400-watt reflectors. In adjacent rows the sequence of mercury and filament units is reversed. Thus, the typical installation, with equipment of both sources on 13 ft by 13 ft centers, may be expected to deliver 50 footcandles.



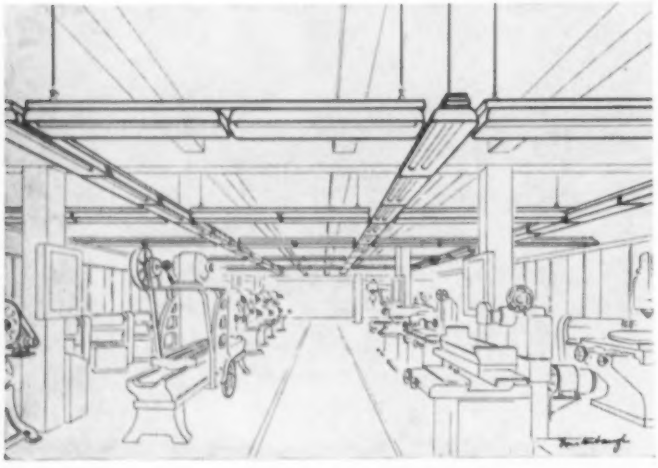
Combination systems, often chosen for their capacity to satisfy requirements of high level, good color quality illumination with economy, are usually maintained from the craneways. In many respects, therefore, the type of heavy industry location where quality as well as quantity must determine what standard must be sought in lighting, finds its many sided illumination requirements fully satisfied with mercury and filament equipment.



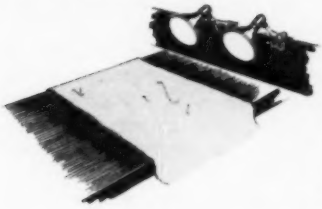
## SYSTEM NO. 6

In many manufacturing processes or laboratory operations there are tasks which call for critical seeing throughout the normal working day. In order to assure the top performance from skilled technicians or researchers many organizations are providing carefully controlled plant conditions. Lighting from a grid system of continuous rows of fluorescent units provides an ultimate in high level illumination. In adopting the superior levels of illumination which such a system delivers, a careful consideration of all factors influencing the lighting environment and the tasks look to balancing comfort (quality) aspects with quantity.

Faster, easier seeing in conditions that conserve physical energy play a large part in determining the character of lighting a given operation should have. The good system, which is a double continuous row type, calls attention to the steps by which industrial fluorescent lighting can be progressively built up to higher standards. Good systems are advisable where levels of from 80 to more than 100 footcandles offer the degree of illumination intensity required by the difficulty of the tasks.

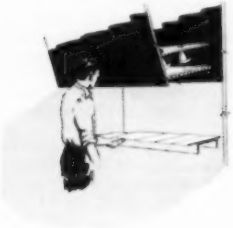


# Inspection, Repair Work Needs Proper Lighting



An inspection operation, in which the task consists of checking the form of finely coiled filaments, is demonstrated in the sketch. With downward light provided at high level from the shielded fixture over the table, and upward light of low brightness through a luminous panel, inspection is accelerated because seeing is easy and accurate. As pointed out previously, localized lighting requires much greater care in its selection and application than does general lighting. Factors of intensity, direction, color quantity, etc., must be taken into consideration, as must the eyesight of workers who have been trained to specialized jobs.

Parachute inspection, on which human safety may depend, is largely dependent upon the thoroughness of this visual operation. Here again, upward light from a transilluminated panel, plus an environment conditioned by good quality general illumination provide the essential aids. Defects in fabric or seams can be quickly spotted by an experienced operator working with these visual aids. At the present high cost of skilled technical employees, no plant management can afford to run the risk of visual exhaustion.

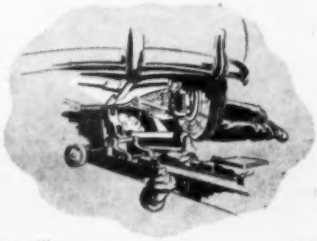


Fabric inspection (in this case for coarse roofing material) wherein the problem is noting any one of a variety of defects in a textured surface. The pair of inspection lamps throwing high level illumination across the surface makes possible a rapid checking process capable of maintaining exacting quality standards. Recommended Practice of Industrial Lighting, available from Illuminating Engineering Society, 51 Madison Ave., New York City, gives a table of recommended minimum footcandles in service for various operations.

Color matching problems occur in many industrial processes. Many of these can be performed by a standard inspection operation under a "color hood" in which balanced spectral quality insures a consistency of color judgment by the inspector. Supplementary lighting sources should be carefully designed so that the light is confined to the immediate working area. Failure to observe this precaution may cause extreme annoyance to other workers in the vicinity.

Polished or unpolished metal sheets present some special problems for visual inspection. An inspection operation, pictured in the sketch, in which edge lighting with a battery of R-40 lamps is the technique employed, reveals many surface defects. The grazing angle at which the light strikes the surface supplies the inspector with the means for spotting even minor scratches or pitting. Clearly defined shadows, without excessive contrast, are a distinct aid in many operations, such as engraving and scribed layout work.

The work world has many visual tasks which must be performed from difficult physical positions. Thus the great number of fleet garage repairs to underbody areas of a car or truck must be undertaken with the aid of a special service lighting device. Portable illumination outfits exist in many forms and the majority of them are excellent. The fluorescent device, suggested here, offers the advantage of a relatively large source of low brightness which can be directed at any point of the truck's underframe desired by the mechanic.



# Compressed Air Conservation — Case Study Shows How To Attain It

**Systematic survey of entire compressed air system only way to ascertain uses and misuses . . . Six major causes of air wastage uncovered by author at one plant . . . Details of subject survey a guide in conducting one in your plant . . . Specific corrective methods outlined and typical examples given . . . Defective valves and fittings and personal use by employees two major causes of air loss . . . Air use by employees a safety and economic hazard**

By **WILLIAM J. O'CONNELL**, Process Engineer
Moraine Products Div., General Motors Corp.

COMPRESSED AIR can be an expensive utility if misuse or waste is allowed to flourish unchecked. When used properly, and in the right places, it is economical and efficient. Unlike water, it cannot be seen; unlike gas, it is not dangerous. But, like both of these, it costs money. In the modern industrial plant it plays an important part in production and process operations. It is used as a dryer, a parts ejector, a chip remover, a cleaner, a cooling agent, a power source. Constant vigilance on the part of the plant engineer and his aides is necessary to assure proper, economical use and to guard against excessive leakage.

The only way to become reacquainted with the production end of the compressed air system is by a thorough, systematic survey. In this way, and no other, can all the uses and misuses of this utility be discovered. The savings obtained, if proper use is made of the survey material, will far exceed the money and labor expended in its making. A survey made by the author will serve as an illustration of the method, the facts uncovered, and the results obtained.

In the plant surveyed, four compressors from a central location provide approximately 4300 cfm of air at 85 psi. These compressors run continuously, operating unloading during periods of low demand. Two compressors are driven, each by a 200 hp synchronous motor, one by a 250 hp synchronous motor, and one from boiler steam, reducing it from 150 to 20 psi, at which point the steam is used for process. There is no accurate method of determining air consumption at any specific time since the air is not metered, either in the main header, or in the lines to the various departments. Reductions in air losses are sometimes made apparent when compressors maintain rated pressure during periods of critical usage; in some cases by means of calculation; and, in other instances, when requests for the installation of an additional compressor are less frequent and insistent.

The method of making the survey was one entirely of observation. It was known that air was being wasted or misused. To discover exactly where, each department was surveyed individually, the layout print of the department being used to mark locations and to make comments.

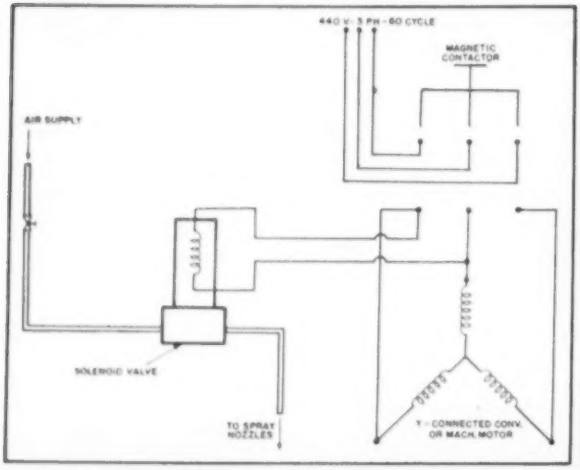
The following were found to be the major causes of air wastage:

a. Air outlets larger than required for the specific operation.

b. Air outlets left open when operator completes job and leaves his station.

c. Air leakage due to defective valves or fittings.

d. Use of air by employes for per-



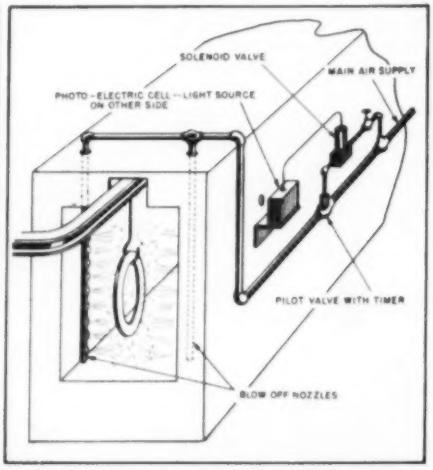
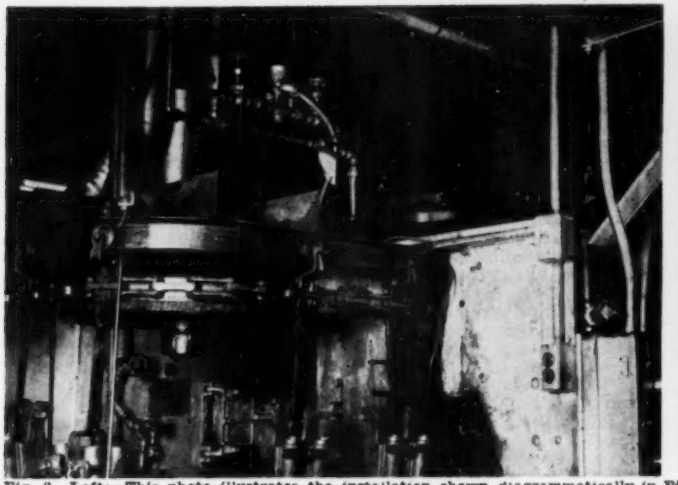




**Fig. 1. Left: Suggested method for connecting solenoid coil to operate when either the machine or the conveyor is started. Valve permits air flow as long as the motor is operating. Fig. 2. Section of washer and piping arrangement. Passing work interrupts photoelectric cell light source thus actuating the solenoid valve. Open solenoid valve energizes the pilot valve allowing air to flow to blow-off nozzles. Bleeder type timer on pilot valve permits regulation of length of blow-off time**



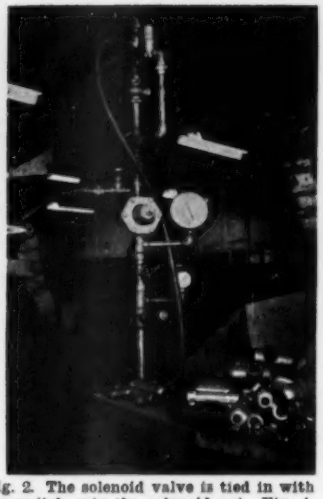


**Fig. 3. Left: This photo illustrates the installation shown diagrammatically in Fig. 2. The solenoid valve is tied in with the conveyor switch seen at the lower right. When repairs are to be made, the upper switch cuts the solenoid out. Fig. 4. Right: This is essentially the same type of hook-up made, in this case, on a boremill circuit**

sonal cooling or cleaning purposes.

Two other items were also found to contribute to the operating expense, but these are specialized, and will be dealt with individually in a second article. These are:

e. Use of air where another utility would do a better job.

f. The expense entailed because of the complete centralization of the air compressors without small, portable, stand-by units.

**a. Air outlets larger than required for the specific operation.**

Particularly during the war years when material was difficult to obtain, the copper tubing, used for air outlets, was installed indiscriminately. The survey found 3/16, ¼, and ⅛ in. tubing all installed upon the same type of equipment. Tests made upon pertinent equipment showed that for drilling operations where the air blows for the duration of the entire operation, a 1/16 in. opening was sufficient. For certain press operations where a short blast of air was used only to keep the die bed clean, a ⅛ in. opening was necessary. On punch presses where air was used to strip the die of its work, and then eject it, a special manufactured nozzle with an opening ½ by 1/16 in. was found to do the best job.

It was also found that rather than use any specific size of tubing, or swedge the tubing end, a nozzle with the required orifice drilled in it served the purpose best. Machine operators have an incurable tendency to try to adjust things to suit their particular liking. Therefore, when copper tubing was used, screwdrivers, pliers, or any handy instrument, were used to open, close, or flatten the tubing ends. With a drilled nozzle, this could not be done.

No analysis was made of the amount of air saved by the use of smaller openings because there was no way of determining accurately just how much air was used prior to the change. The amount, however, is not inconsiderable when a table showing the amount of air through an orifice is noted. An opening of 3/8 in. at 85 psi with 100 per cent discharge coefficient permits a discharge of 203 cu ft of free air per minute; ¼ in., under the same condition, allows 90 cu ft per minute; ⅛ in., 22.6 cu ft per minute; 1/16 in., only 5.64 cu ft per minute.

**b. Air outlets left open when operator completes job and leaves his station.**

When a manual hand valve controls the air discharge, very often the operator will leave the machine without closing the valve after finishing an operation. Such lapses in economical operation are challenges to better worker training. It is better, nevertheless, if the human factor is eliminated. The discussion here refers specifically to locations where the air blows continuously during the operation, and cannot be made intermittent. This is particularly true in washers where the air is used for drying, and on certain machines where the air is used to cool the drill or tool bit, as well as to remove chips.

Two corrective methods were used here. In the majority of cases, a solenoid valve as in Fig. 1, was installed in the main air supply line to the machine or washer. The solenoid circuit was connected to the medium that would be shut off when the operation ended. In the case of conveyorized washers, the solenoid was tied in with the conveyor drive switch, because this was always pressed at the end of the shift, or during lunch periods.

On drilling machines, the circuit was tied in with the drill head motor. In a special case, a photo-electric cell and a pilot valve was also included in the circuit. See Fig. 2. In this case, with the work on a chain conveyor, the chain was not always filled, but as long as the work was passing through the washer steadily, without too long an interval between pieces, the blast was required to be continuous. Since the conveyor ran through lunch periods and shift changes, an independent solenoid valve could not be used. Instead, an assembly was installed where the work on the conveyor would break a light source and actuate a photo-electric cell. This, in turn, would actuate the solenoid valve, which would energize the pilot valve. By means of a needle valve in the pilot cylinder controlling a long bleeding time, the pilot would keep the air blast continuous under conditions of normal production but, if the work ceased passing, the air would shut off. Calculations showed that air consumption, where these installations were made, was cut about 7 per cent.

**c. Air leakage because of defective valves or fittings.**

During working hours it is very difficult to discover air leaks. The noise of machinery will hide the hissing of a leaking valve or fitting. Therefore, this phase of the survey had to be made on weekends. It was found that all departments using air as a prime mover for drill or broach heads had an average of one air leak per machine. In other departments leaks were also common. They varied from small, scarcely noticeable hisses to those that could be heard many feet away. Leaks of this nature are major factors in air conservation since this type of wast-

age is continuous, 24 hr a day, seven days a week. This was primarily a maintenance condition, so the findings were turned over to that department for correction. A weekend maintenance plumber, as an adjunct to his other duties, was detailed to devote a regular portion of his time to hunting down and repairing newly developed leaks.

A great number of these leaks were found to be caused by sloppy installation work, rather than from natural deterioration. To prevent this, the plumber is now required to liquid-soap-leak-test each joint after assembly, and the plumber foreman inspects the finished job.

**d. Use of air by employes for personal cooling or cleaning purposes.**

A very serious condition that results during warm spells is the use of compressed air by employes as a personal cooling agent. This is primarily a supervisory problem but it cannot be ignored in this report since the use of compressed air as such presents a serious pressure problem, as well as a dangerous safety situation. The prevention of this condition can be much more easily controlled by stressing the safety aspect, and providing penalties.

From the viewpoint of our department, however, it is the air usage and subsequent lowering of the air pressure that must be regarded as the important consideration. Generally speaking, when a person turns an air hose upon himself for the cooling effect, it is an open hose without a nozzle. Under such conditions, it does not require very many open outlets to equal the output of one compressor. The hand blow valve nozzle will probably have been removed, rather than fastened down, and the air controlled only by the main shut-off valve. Assuming an average opening of 3/16 inch, each outlet used for cooling purposes would consume approximately 70 cu ft of free air per minute. Twelve such outlets would tax the capacity of one compressor. Moreover, production loss due to poor operation of air tools at low pressure is also apparent. Most air tools are constructed to operate at pressures between 80 and 100 psi. When the pressure falls below the rated minimum, operating efficiency either falls off badly, or the operation stops completely. The Compressed Air Handbook very nicely illustrates the effect upon efficiency caused by low air pressure. For portable air tools, a 37 per cent average increase in production can be obtained for about a 30 per cent increase in air consumption by increasing the air pressure at the tools from 70 to 90 psig. At the same time labor costs remain constant. The reverse is true for a drop in air pressure.

It is readily apparent, therefore, that this one type of air wastage can have costly consequences. It was the only condition found in the survey that deliberately caused a drop in air pressure. All other causes were more or less constant, and pressure was maintained. Only the personal cooling operations were followed by a decrease in production. Closer supervision, more severe penalties, and a management safety campaign have made this a minor problem. It is intended to stress this program each spring.

Where possible, when compressed air is used as a parts ejector, or chip remover, the blow should be intermittent. These items were not covered in the survey because in the plant surveyed, intermittent operation in such cases is standard practice. Another item not covered in the survey, but nevertheless an important consideration, is the fact the portable air tools are not subject to theft in the same degree as, for example, are portable electric tools.

In conclusion, it might be stated that it has been estimated by the General Motors Plant Engineers Subcommittee on Utilities, that in all General Motors divisions, if all proper conservation measures were taken in regard to compressed air, the yearly corporate savings could be in excess of $1,000,000, a not inconsiderable sum.

## Air Cargo Terminals—Engineered For The Job

DURING THE past year Lockheed Aircraft Corp. and cooperating companies have been studying the various phases of air cargo materials handling. The results of the study were presented at the recent meeting of the ASME in New York by L. R. Hackney of that company.

Simmered down to its essentials the study resulted in choosing a structure like that shown by the model. Each wing of this V-shaped building provides 5000 sq ft of enclosed warehouse area plus necessary office space. It provides space for the handling of a maximum of four cargo transports simultaneously.

In air transportation, spotting the airplane next to the loading dock presents problems due to the tail and wings. Extension of the wings over the loading dock areas is a dangerous and difficult practice for the surfaces are exposed to damage from fork lift trucks and other movable equipment on the dock. To overcome this difficulty it was elected to spot the "inner" positions as close to the airplane loading dock as possible without the wing tip extending over it. The resulting gap is bridged with a loading ramp which is extendable and pivots from the dock side.

Careful study has been made of all factors entering into and affecting inside and outside materials handling. The type described as an "open loading system" was selected. This system utilizes an endless overhead chain conveyor which is continually moving in an oval flow pattern. The chain conveyor, hung from the ceiling of the warehouse, tows both empty and loaded hand trucks at a speed of 3 mph.

Cargo is received from the delivery truck and off-loaded by gravity down a conventional roller conveyor.

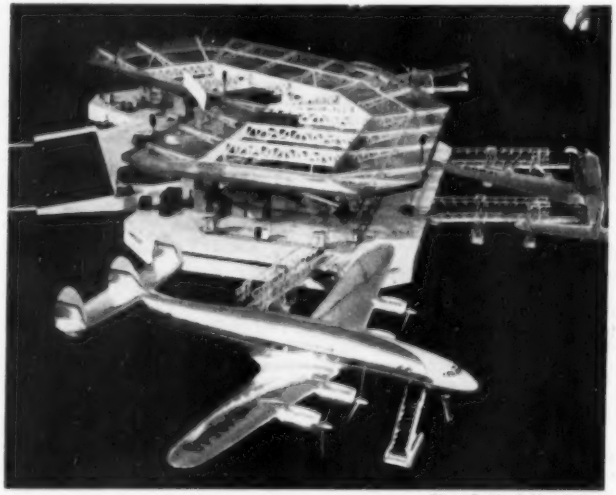


Photo: Lockheed Aircraft Corp.

**Extendable ramps and the open system of internal handling equipment are two of the features of this proposed air cargo terminal**

# SELECTION, USE AND CARE OF TOOLS

## Files—Be sure to make the correct choices for the average plant assortment

By **THOMAS TRAIL**, Maintenance Engineer

FILES ARE AMONG the most diversified of all tools; they are made in more than 250 styles and 1,000 different cuts and sizes. In order to choose the file best suited to a particular job, therefore, it is necessary to have an understanding of the fundamental purposes of the most-used types.

Files are classified according to length, shape and cut. In length they usually range from 4 in. to 18 in. depending upon the type; not all files are available in all lengths. File shapes, Fig. 1, include flat, round, half round, square, triangular and various others. Some files are tapered toward the point, while others are made the same width throughout their length, Fig. 2. The former are called tapered files; the latter, blunt files. The edges of some files are rounded, while others may have one or more edges uncut (safe) to confine their cutting to only certain surfaces.

The cut of a file depends on the type of teeth and their relative coarseness. Single cut files (which include mill files, taper files and some saw files) have only one course of teeth across the surface, as shown at (a) in Fig. 3. These files are usually used with a light pressure to produce a smooth finish, or a sharp edge on various types of cutting blades.

Double cut files have two courses of teeth crossing each other, as shown in Fig. 3 at (b), one course being finer than the other. These files include machinists' files of the flat, square, round and half round types. They are generally used under heavier pressure for fast metal removal.

Curved tooth files have undercut milled teeth, as shown at (c) in Fig. 3, which produce a very smooth finish without scratches. These are usually employed on flat surfaces where a very smooth finish is desired.

The relative coarseness of file teeth varies with the type of file and its length. In American Pattern files, tooth coarseness ranges from "rough" to "dead smooth," while in Swiss Pattern files the range is from No. 00 to No. 6. Curved tooth files range in coarseness from "regular" to "smooth." The actual coarseness (teeth per inch) in each classification varies with the length of the file; the longer the file the fewer the number of teeth per inch.

In general, most shop filing can be taken care of with the following assortment of files: several 12-in. mill files of "second" and "smooth" cuts; a few machinists' flat, round, square and half round 12-in. files, "second cut"; several half round, square and round "smooth cut' 12-in. machinists' files; a couple of 8-in. "smooth cut" triangular files; a 6-in. "smooth cut" warding file, and a knife file of the same size and cut; and a 12-inch curved tooth file having one side coarse and the other side fine. Where filing of a precision character must be done occasionally, an assortment of Swiss Pattern files, or needle files, of various cuts will prove very convenient.

In using a file, place the work at a convenient height. This varies from below elbow height for heavy work to near eye level for fine work. See that the work is held securely. Loose work causes file chatter that dulls the teeth. The file should be held as level as possible, in order to produce a flat surface, and its course changed sufficiently to prevent grooving.

Avoid the use of too much pressure on the file, as well as too little pressure. The former may chip the teeth, while the latter will dull them. Apply moderate pressure on the forward stroke so as to keep the teeth cutting, and lift the file slightly on the reverse stroke in order to clear the work and thus prevent dulling the cutting edges by wearing away the back of the teeth. However,

*(Continued on page 98)*

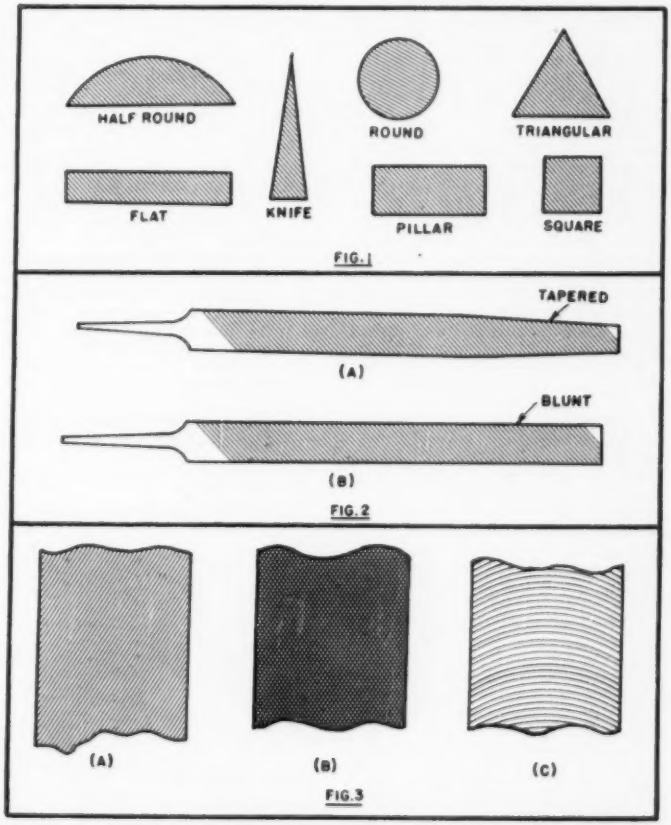



**Fig. 1. Typical file cross-sections show the variety of types available. Fig. 2. Tapered and blunt files add two more characteristics which increase the number of kinds available. Fig. 3. Single cut, double cut and curved tooth files**

# Kick the Fumes and Dust Out But—SAVE THE HEAT!

**In many plants the removal of large quantities of dust or fume-laden air means that equally large quantities of outside, unheated air will rush in to replace it . . . The author here presents several schemes for the introduction of outside air without straining the heating plant . . . Such practices will enable a smaller heating plant to take care of requirements and also reduce fuel bills . . . Drawings show adaptations**

By **WILLIAM W. GAYLORD, Consulting Engineer**

MANY INDUSTRIAL processes require that large quantities of air be exhausted to remove dust, fumes or smoke from working space in order to maintain proper working conditions. In most cases this means heating large quantities of outside air to replace that exhausted in order to maintain comfortable working temperatures. This, of course, will materially increase the size of the heating system, the load on the heating system, and the cost of operating it.

The following example will illustrate these points. Assume a building 60 ft wide, 200 ft long with an average height of 15 ft and the usual amount of glass windows. With no exhaust system it will require a heating system with an output of 3680 sq ft equivalent direct radiation (edr) and, based on a 6000 deg-day heating season will require about 2,024,000 lb of steam per year. Allowing $0.50 per 1000 lb of steam this is an annual fuel cost of $1012.

Now assume that we install grinding and polishing equipment requiring the exhaust of 30,000 cfm of air or 1,800,000 cu ft per hour. The air exhausted must, of course, be replaced from some source. If no provision is made for supplying and warming this air it will be drawn in from outdoors through any leaks or openings it can find and make it impossible to properly heat the building in cold weather unless additional heating equipment is provided.

In the case assumed, if the outdoor temperature goes down to 0 F while the exhaust system is in operation, the average building temperature will be reduced as much as 30 or 35 deg unless additional radiation is installed. If a temperature of 70 F is to be maintained in the building when the outside temperature is 0 F and 30,000 cfm or 1,800,000 cu ft of air per hour is being exhausted it will be necessary to provide at least 1,620,000 cu ft of air per hour which has been heated from 0 F to 70 F. The heating of this air will require the installation of additional radiation equivalent to 8120 sq ft of direct radiation.

Assuming the plant to operate on a 40 hour week and that the exhaust system and additional radiation will be shut off when the plant is not in operation the heating of this air will require about 1,100,000 lb of steam per year in addition to that required to heat the building when no exhaust system was installed. This will increase the fuel cost by about 55 per cent more per year under best operating conditions, but unless proper provisions are made for shutting off or controlling output of the additional radiation when the exhaust system is not in use, the cost of additional fuel may be more than double that stated.

One way to obviate this additional expense is to design the system so that the minimum exhaust gives the results required. The extent of saving in this manner is usually limited by State Codes which requiring specific amounts of air to be exhausted from many different types of equipment.

Another way is to clean and recirculate the exhausted air if it does not carry objectionable fumes or materials. Where the air carries only dust from grinders, or chips from wood working machines, relatively simple dust collectors and air filters will clean the air sufficiently so it can be recirculated but for many kinds of exhaust systems this is impracticable.

As an example of what might be done in the case assumed above suppose that 90 per cent of the air exhausted is cleaned in a dust collector and filter and returned to the building at 10 deg below room temperature. If this can be done the additional heating capacity required will be only 1225 sq ft of equivalent direct radiation and the additional fuel cost only about $185.00 per year.

In a case of this kind the savings in the investment cost due to the smaller amount of additional radiation required will often offset the greater costs of the more efficient dust collectors and air filters that must be installed where air is to be recirculated.

It has been proposed that where the exhaust gases are too badly contaminated to be cleaned and recirculated the use of heat exchangers

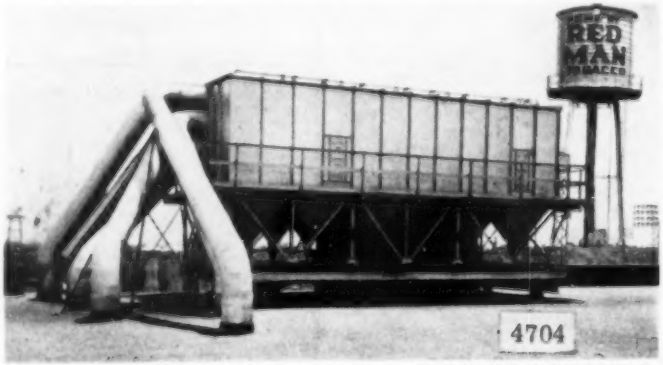



Photo: The W. W. Sly Manufacturing Co.

Fig. 1. **Dust collector on the roof of a tobacco processing plant in Toledo, Ohio. It collects dust from the cleaning and stemming machines**

be considered. But, because of the low temperature difference, which requires a very large heat transfer surface and the difficulty of keeping the exhaust gas side clean enough to transmit heat, such exchangers have seldom proved satisfactory.

A method that has been more successful in some automatic plating machines is to introduce unwarmed outside air under slight pressure directly over the tanks and so directed as to carry the fumes or vapors into the exhaust hoods. (See sketches). In this way the cold air does not get into the working space but does replace the exhausted air.

A modification of this construction can be applied to some automatic buffing and polishing machines where the work travels from a loading point to the polishing wheels and on to an unloading station or where several pieces to be polished are set up in a fixture and put into polishing position as a unit.

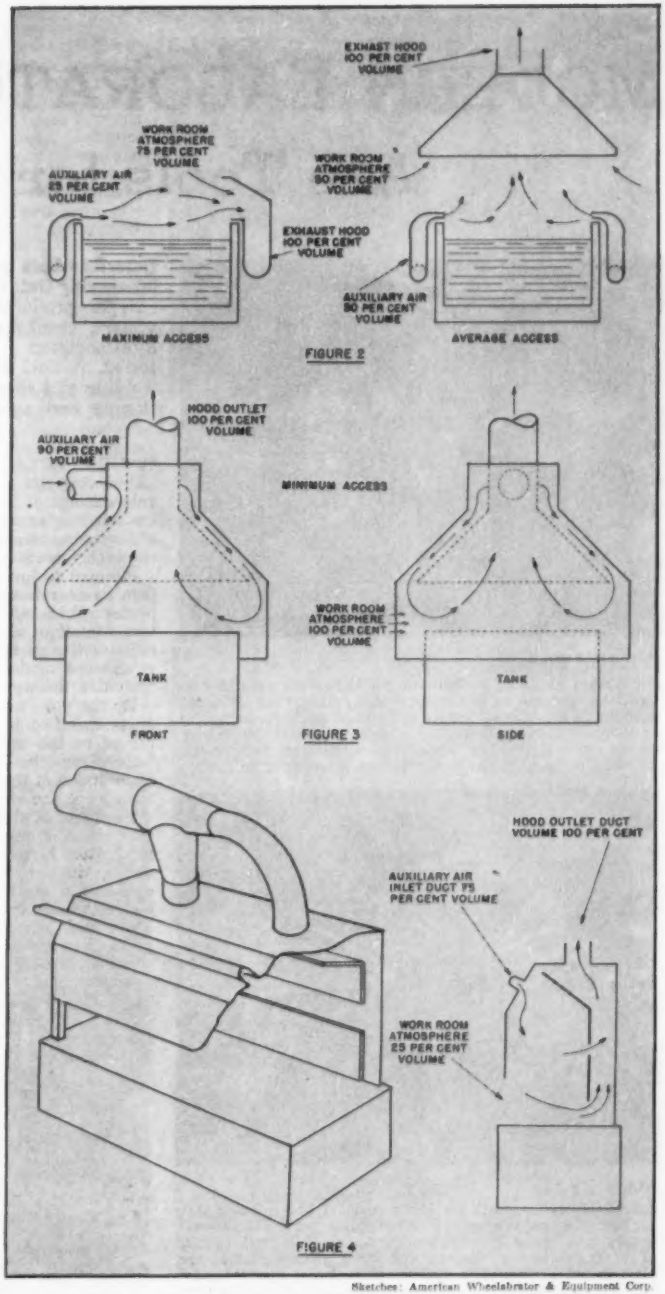
It is, of course, necessary to design the cold air supply ducts and outlets in such a way that the operators will not be working in the cold air stream.

Some attempts have been made to reduce the amount of warm air exhausted at other types of machines by using double walled hoods and introducing cold air between the inner and outer walls of the hoods, Fig. 2, to be released at the work opening and carry the dust or vapors into the exhaust system connected to the hood outlet.

This type of construction requires a double set of ducts and materially increases the size of hoods so that there are many types of machines to which it cannot be applied. Where large quantities of air are to be exhausted from rooms that must be kept at a comfortable working temperature, and the work does not produce heat to counterbalance that exhausted, the possibility of using a system of this kind should be investigated. Any reduction in the quantity of warm air exhausted that can be made by the introduction of unwarmed air at the hoods will make a corresponding reduction in the required heating.

Another point which should be given careful consideration is the method of warming or tempering the air that must be brought in to replace the warm air exhausted. Sometimes this is entirely neglected with the result that the room cannot be kept at a comfortable temperature in cold weather. In many cases the amount of radiation installed has been increased to supply the added heat required and the air allowed to find its way in through any leaks or openings in the existing building construction. This method is liable to cause drafts and cold spots and may bring in dust and dirt at points where it is most objectionable.

A much better arrangement is to introduce the needed air through thermostatically controlled heaters.




Sketches: American Wheelabrator & Equipment Corp.

**Fig. 2. Left: Where maximum access is required next to tanks this type of installation can be employed. Right: Where average access is necessary the hood can be placed directly over the tank. Fig. 3. If minimum access is required, the hood can be brought down over the tank and a double-walled arrangement employed. Fig. 4. Modifications of this installation can be employed in many operations. The percentage of auxiliary air furnished for any hood application is dependent on design and the need for access opening usually will dictate the design of the hood. In some applications, such as plating tanks it is possible to reduce the quantity of air exhausted from work room atmosphere to 10 per cent of the total volume exhausted**

# MODERN LABORATORIES
## Are Tools for Production

**Grinding Room**

A separate grinding room with sound-proofed ceiling construction contributes to the quietness of the Gulf Research machine shop. Here, besides grinding operations required on shop work, constant testing of Gulf's grinding oil is conducted in cooperation with oil-development technicians. Lighting throughout the machine shop is tempered to the job

**Stock Room**

Above: Metal racks in the stock room of the machine shop suggest the wide diversity of supplies used. Hexagonal, square and round bars, channels, angles, flats and tubings in brass, aluminum, bronze and steel, stainless steel and plastics are shown. The supply room also stocks extensive series of screws, bolts, drills, dies, tools, and materials ranging from linen to diamonds. In all, there are over 2600 items

**Shop Floor**

This view up the main aisle of the machine shop, from the edge of the assembly bay, emphasizes the unusually good lighting provided by windows and fluorescent lamps and the sense of space achieved by efficient arrangement of machines. Benches are along windows at the left; superintendent's office is at the far rear, right. Planned arrangement saves time

**Described here is is the machine shop section of the lab serving Gulf Oil's research and exploratory work . . . Its products range from clocks to daisy harvesters, crankshafts to gyroscopes, viscometers to dynamometers . . . Cutting oils and grinding oils are tested, it does electro-plating and spray painting, welding and sheet metal work . . . It has air conditioning and a large stock room with 2,600 items**

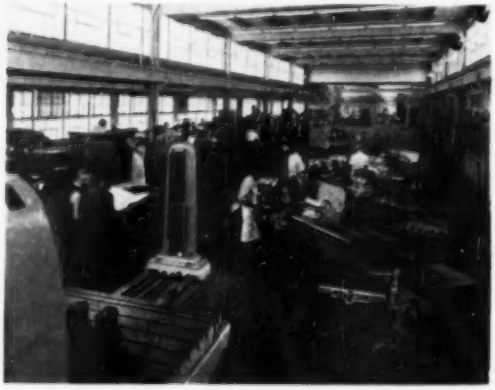
THE SPECTACULAR growth of industrial research during the past few years has made necessary the enlargement of many laboratory metal-working shops. Outstanding among these recently expanded is the new and modern machine shop of the Gulf Oil Corporation's research laboratories at Harmarville, Pa.

Planned to function 100 per cent as a tool for the oil firm's research and exploratory work, the shop is supplying all metal-working requirements of the laboratories' staff of chemists, physicists, and engineers and most of the parts required for geophysical prospecting equipment made by Gulf and used in its exploration activities throughout the world.

By the very nature of the work, a great many of the parts specified by Gulf's research staff cannot be obtained in the open market. Requests usually are for "one-of-an-item" parts which can be made under closer supervision of the designer and frequently more quickly than were the work to be given to job shops.

Products of the shop probably are more diversified than those of any similar shop. They range from clocks for bottom hole pressure gages used in oil well drilling and production, to harvesters used to gather pyrethrum daisies for use in the Company's insecticides. Almost commonplace are such jobs as the grinding of crankshafts and the making of complete units or experimental parts for gyroscopes, high altitude airplane engine pumps, oil well drills, various gages, rolling ball viscometers, and a chassis dynamometer.

Another important role of the shop is that of testing cutting and grinding oils. Products developed by the laboratories' Lubrication Division are evaluated here in both normal and special test machining operations.



Operators who do such test work are especially trained as both machinists and oil test men, and all evaluations are run under the supervision of lubrication research engineers.

The machine shop has 18,479 sq ft of floor space. The main shop and assembly floor occupies 10,676 sq ft, while storage space in the basement and mezzanine consumes slightly more than 2,500 sq ft. Supervisory offices and supplementary rooms occupy the remainder. The supervisory offices, along the building's south wall, are linked together with an intercommunication system that also is connected with the desks of the various foremen in the shop proper.

A grinding room, where a large part of the laboratories' testing of thread-grinding oils is conducted, is partially sound-proofed and is included in the row of special shops. Next to it, in turn, is a paint shop with explosion-proof fixtures and a high-suction spray booth. The electro-plating room, of original design, is a model of efficiency and has a tile floor, a blower vent system for removing fumes, and suitable baths for metal plating.

Welding and sheet metal work, including the manufacture of special truck bodies needed for seismograph operations, is carried out in another sound-proof room, next to the assembly bay. All inspections are made in air conditioned, temperature-controlled quarters equipped with a comparator, an electro-limit gage, a super micrometer, and a jeweler's bench and tools. The stock room carries some 2,600 different items, ranging from waxed paper to steel bars measuring six inches in diameter.

In the center of the shop floor, located so as not to block vision, is the tool cage. Near the supervisor's office, a library table is provided for the men and all metal-working and other publications of interest to such craftsmen are available.

Between 3,000 and 4,000 jobs will be turned out in this shop in the course of a year. A few of these will require but half an hour or less for completion, but some of the larger and more involved assignments will require several thousand hours of machining, assembly, inspection, and testing.

**Sheet Metal and Welding Shop**

**Located off the assembly bay of the machine shop this sheet metal and welding room is sound-proofed to eliminate excessive noise from the main floor. Special truck bodies, storage tanks, ventilating units, gear boxes, machine guards are among the many items fabricated in this department**

**Temperature Controlled Inspection Room**

**Inspection work is conducted in this room. It is equipped with all modern instruments (many of which the shop makes itself), comparator, electrolimit gage, profilometer, jeweler's bench and tools. In the foreground a technician inspects detector parts, at the right one works with the profilometer**

**Marsh Buggy Is Born**

**Above: Automotive equipment specially built for oil exploration as well as for other field activities, is assembled, equipped and repaired in this assembly bay. Photo shows work on the chassis of a marsh buggy, a huge-wheeled vehicle developed by the laboratory for prospecting work in swampy and flooded regions. Even daisy cutters have been made here**

**Plating Shop**

**Primarily for instrument plating this shop off the main floor of the machine shop was designed by laboratory engineers. Copper, nickel, chrome, silver, cadmium, lead, tin and indium are used for plating in the 4-gal baths. Blower vent system carries off fumes from the top of the baths and lamps are vapor-proofed for further safety. Floor is all tile**

# How to Standardize Instrument Calibration in Your Plant

**With the assumption that instruments are necessities in the modern plant, the author points out that accurate calibration is also necessary . . . Description of instrument shop layout and lighting . . . Establishment of standard practices and procedures . . . Test set-ups for gages and instruments . . . Details of standards and their plant application**

By **GEORGE A. LARSEN**, Instrument Engineer

GOOD INSTRUMENTS, properly selected, calibrated, and maintained are essential to the operation of a modern plant. Since this is the case in our refinery we have felt the need for an organized and independent Instrument Department whose function is to specify, install, and properly maintain the plant instrumentation; and whose direct responsibility is to insure accurate and economical operation of this equipment.

A most important part of the Instrument Department is the well equipped shop, located approximately in the center of the operating units. Because of the close adjustments necessary when calibrating instruments good illumination for night or day work is important. Our repair and calibration shop has excellent day illumination afforded by large windows. Night lighting is provided by fluorescent and incandescent lighting.

The large worktable in the shop is covered with ⅛ in. steel plate to permit better handling of heavy equipment such as valves and flowmeters. One end of the workbench is equipped with two flowmeter test racks and the necessary manometers, air connections, regulating valves, and provided with drip pans to catch all spilled mercury.

In an effort to improve departmental and equipment efficiency we have adopted certain standard practices and procedures which may be of interest to others.

Under the maintenance section of these standard practices and procedures falls the constant calibration of all instruments to keep them operating at peak efficiency and accuracy.

If the orifice sections to which a meter or control are connected are not properly installed the best instrument will not give a true indication of flow. For this reason we have set up the following standards on orifice sections.

All orifice sections or primary elements receive special attention from the instrument department personnel. A number of special points must be observed and followed if satisfactory results are to be obtained. These key points follow:

Carefully check the length of straight pipe preceding and following the orifice. These distances must conform to ASME requirements.

Line must be of uniform bore and free of burrs or roughness. Pipe must extend through flanges so there will be no recess between the face of the orifice plate and the end of the pipe. If weld neck flanges are used, the inside of the orifice section must be of uniform bore and free of welding burrs or roughness.

Orifice taps for liquid measurement are always made on the side of the line or flanges, while taps for gas, air or vapor measurement extend upward from the line of flanges.

The size of the tap may be within the limits of ¼ in. minimum to ¾ in. maximum. Line size and service determines this size.

The pressure tap must be absolutely flush with the conduit wall and free of burrs or roughness. Microscopic burrs on the hole edge of an orifice tap have been known

Fig. 1. View of the instrument shop showing storage racks for instruments and repair parts. To the left of the basin is the testing panel, at the right is steel-covered worktable

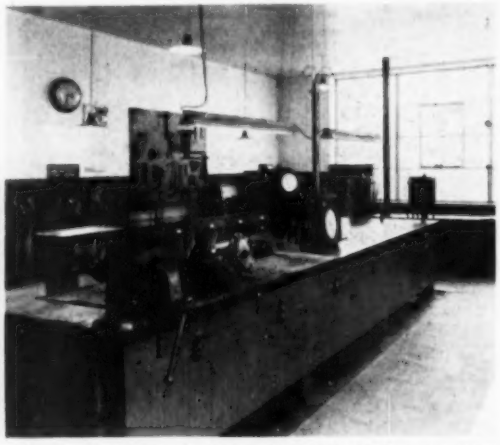


Fig. 2. This view illustrates the good lighting necessary which is accomplished with a combination of natural daylight, incandescent, and fluorescent lamps and light walls

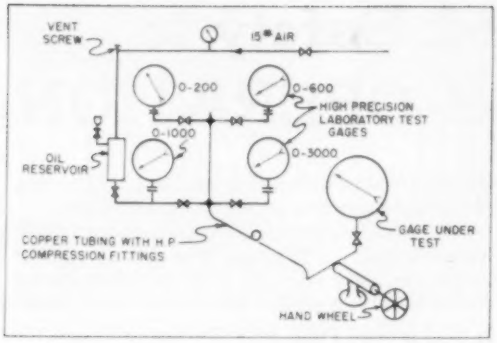



**Fig. 3. Drawing of testing panel for testing indicating and recording pressure gages. All valves are steel needle valves. Fittings and valves are back welded. The four master gages span the range of 0 to 3000 psi**

to produce errors as high as 4 per cent.

Location of taps: (a) Flange taps 1 in. upstream and 1 in. downstream with respect to the face of the orifice plate. (b) Pipe taps should be located approximately 2½ pipe diameters preceding the plate and 8 pipe diameters following the orifice plate. (c) Vena contracta taps require the upstream connection or tap located one pipe diameter from the face of the orifice plate and the down-stream or low pressure tap approximately ½ pipe diameter from the plate. This distance varies slightly with the pipe-to-orifice diameter ratio, generally referred to as Beta or d:D ratio.

The d:D ratio should not be permitted to exceed 0.70 nor be less than 0.20.

Orifice plates must be carefully centered in the lines to produce correct pressure readings. The plate should be made to fit the bolt circle of the flanges with which it will be used.

The orifice edges must be sharp and square. Plate thickness must not be greater than 1/30 of the pipe diameter. On the line sizes under 4 in. the plates made of ⅛ in. materials are counterbored to the required thickness. This method is preferable to the conventional beveled edge plate that was so often replaced wrong after its inspection.

The orifice i.d. must be carefully checked during inspection periods and the handle marked to indicate the last calipered size.

Connecting lines between the primary element and the instrument must not be less than ½ in. and they should be graded at least 1 in. per foot to eliminate vapor or condensate traps.

In the measurement of light hydrocarbons it is important to locate the orifice section at a point lower than the level of the material flowing from a drum or vessel. Flashing of the more volatile materials occurs when the orifice is installed above the mean liquid level.

Because so many of the materials handled in a refinery are of such high temperature, pressure, or corrosive content it is necessary that the instruments themselves be checked at regular intervals. For this checking we use the following calibration methods.

All differential type and mercury-less or force-balance instruments are calibrated dry using single-column well type manometers of various ranges. Low-range pressure gages and pneumatic receivers are carefully checked by comparison with a precision mercury manometer calibrated in lb/in.$^2$ and tenths. The dial type standard indicating pressure gages are checked by comparison with test gages. (See Fig. 3.)

The gages are tested periodically with the dead-weight tester which is ordinarily kept under lock and key. With more than three thousand gages in the plant to maintain, this is our method of doing the job quickly and efficiently.

Potentiometer recorders are quickly and conveniently checked with a series of check coils of fixed values. For checking purposes we replace the cold-junction coil in the recorders with one of these coils of predetermined value. These coils merely supplement our portable testing equipment and are used primarily for determining whether or not the fault lies in the instrument or its external circuit.

Thermocouples made from duplex glass-covered wire are being used quite extensively where temperatures do not exceed 800 F.

Calibration checks on the operation of the instrument are made periodically in the shop as a routine service practice.

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## Rigging Idea Saves Time and Money on Construction Job

**Contributed by MacMen, Inc., General Contractors**

THREE WEEKS VALUABLE production time and several thousands of dollars in construction costs were saved by our firm when erecting latticework conveyors for the Torrance Sand & Gravel Co.

Ignoring the time-proven but slow and expensive procedure of using a crane to lift the conveyors, piece by piece, high onto erect pinions, we conceived the idea of assembling the openwork shafts on the ground and then raising the structures into position. An estimated three-quarters of the crane time was saved as well as about one-half the labor.

Key to success of the operation was the method used to rig the crane cables when raising the assembled conveyors. This had to be done so that the weak 120 ft long shafts would not warp or break while in the air. The lifting force had to be controlled carefully so that it would spread evenly over the entire length of the shaft during the lift.

**With two sand and gravel conveyors already hoisted successfully into position via the new method, crews prepare to lift the last of the structure into position**

# Device Adds Speed, Safety to DRILL PRESS OPERATION

Fig. 1. Here it is holding work where the drill is breaking four holes together. Terrific torque and vibration are set up

**Designed to absorb the torque, this device is a mating of safety feature and production improvement . . . Universal hold down clamp holds work securely to the work plate . . . Equalized floating absorption of torque eliminates over and under-sized threads and broken taps . . . Available with the device is a series of work-holding plates designed to eliminate jig and fixture costs where possible . . . Cuts drill breakage**

Plant Engineering
*Product Application Feature*

BADLY CUT HANDS, broken drills and scrapped work pieces, due to work "getting away" on a drill press or tapper, will soon be practically a thing of the past, according to reports we have been receiving.

The device responsible for this remarkable statement is Torkarm, a patented attachment that offers a solution to work-holding and safety problems. It also cuts setup time to a fraction, improves quality and reduces costs.

Torkarm clamps onto a drill press of any size. Operating on the same principle as a pantograph-type drafting machine, it holds work securely yet permits the operator to move it freely across the work table—an operation which usually requires changing of complicated setups including a vise and cumbersome clamps. It converts the torque of a spinning drill, tap or reamer into a useful force which aids in holding work in place. In fact it is as simple and efficient as though the work were actually held in the operator's hand. The device has been developed into a multiple purpose attachment which can be quickly clamped onto almost any drill

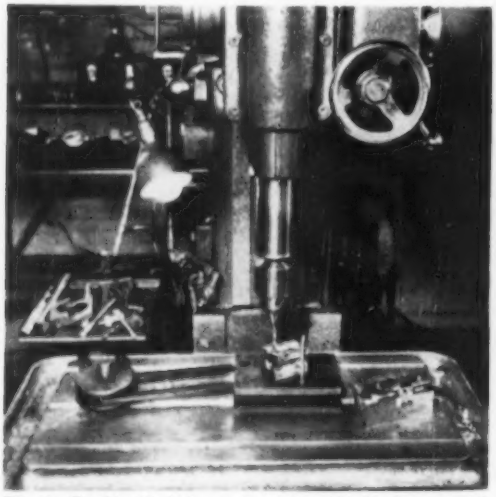


Fig. 2. Tumble jig between two pins. No hands are used to hold work in proper position, an added safety feature

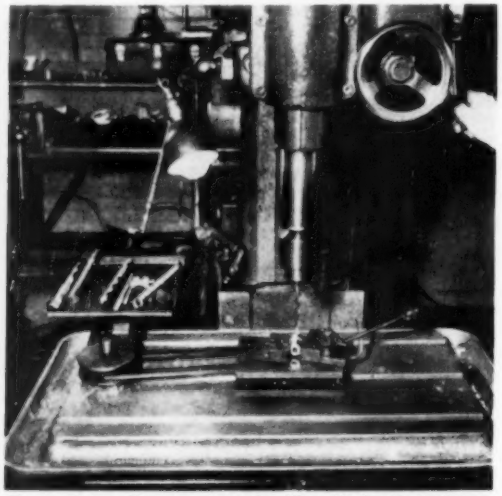


Fig. 3. A two-diameter vise grip. Note the handy tool tray at the left. Torque of drill is turned into useful work

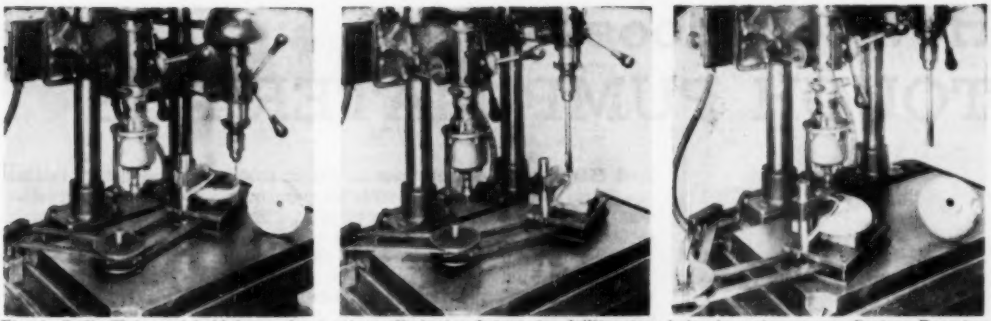


**Fig. 4. Left: Universal hold-down clamp set-up eliminates fixture for drilling two holes in motor cover. Center: Reaming the motor cover with this set-up. Right: With same set-up as at center the operator taps two holes. Note finished cover**

press or vertical tapper, without using a bracket or drilling a hole.

Also developed has been a series of cam locking and "hold down" work plates which make it possible to quickly drill, tap, or ream practically any shape or size piece, regardless of the horsepower applied. Tumble jigs can be used on the face of these plates between two pins which completely absorb all of the torque, yet the jig can be tumbled at will and moved from center to center as fast as the jig can be moved across the plate or the plate moved across the drill press or tapper table.

The "free movement torque absorption" attained by Torkarm is due to the action of two pairs of arms, hinged in parallel on fixed centers at both ends and in the middle. The hinging allows free lateral movement. The fixed center arrangement forces the arms to remain parallel, which in turn assures their remaining equal in length regardless of any position they may assume. Since each set of arms is tied and hinged individually at one end to the table and at the other to a "free" work plate —the plate cannot rotate. Thus, the plate remains stationary under torque but moves freely across the horizontal plane of the table in any direction when lateral force is applied as is the case in moving work from center to center under a spindle.

If you want additional information on this device just drop a line to The Editors, Plant Engineering, 53 W. Jackson Blvd., Chicago 4, Ill. Or, write "Torkarm" on the no-postage-required card on pages 29 or 79.

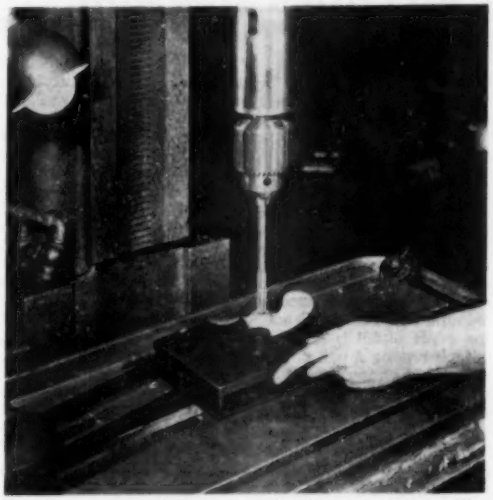


**Fig. 5. Reaming odd-shaped work without a fixture. The propeller is not locked; it is placed on parallels between pins**

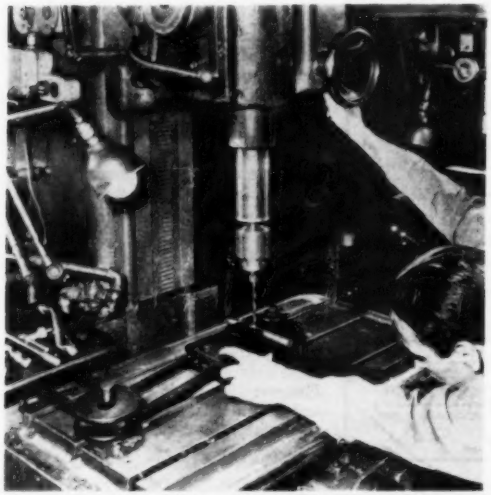


**Fig. 6. Cross-hole drilling without V-blocks, yet the piece is held securely, only lateral force will move the plate**

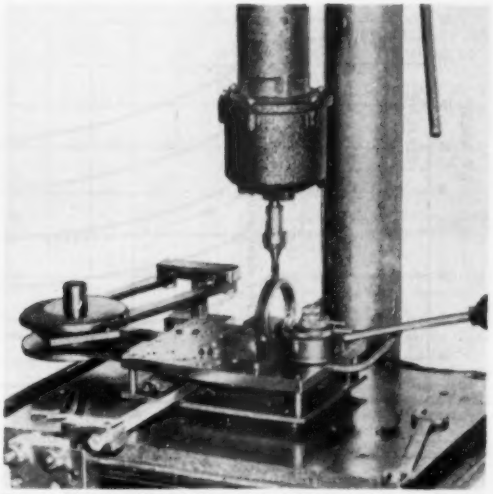


**Fig. 7. Tapping three holes. The plate floats, yet it remains fixed under the tap. Float of plate controlled by taper pin**

# How to Choose TOUGH PUMP MATERIALS

**Part III[2] . . . The significance of pH in pump material determination . . . Variation of pH values with temperatures . . . Galvanic corrosion, what it is and what to do about it . . . Explanation of the galvanic series of metals and what it means to pump buyers . . . Effect of load factor and structural features on the choice of materials . . . Metallurgical advances also have their influence . . . Table for general guide in selecting boiler feed pump materials . . . How stainless steel serves the pump user . . . Weldability of stainless steels**

By **IGOR J. KARASSIK** and **ROY CARTER**[1]
**Application Engineers, Worthington Pump & Machinery Corp.**

THE pH value of a liquid is a quantitative representation of the relative acidity or alkalinity of this liquid. The lower the pH, the more acid the solution.

For instance, a solution having a pH of 7.0 is neutral, (pH values above 7.0 indicate alkalinity and pH values below 7.0 indicate acidity). But, since the pH value is expressed in a logarithmic scale, it must be remembered that changes in pH represent more than a direct linear change. For instance, a solution having a pH of 5.0 is ten times as acid as one having a pH of 6.0.

The pH of a given solution varies somewhat with temperature changes, decreasing rather rapidly up to 300 F and remaining fairly constant above that. For instance, a solution with a pH of 8.5 at 70 F, will have a pH of about 7.0 at 300 F and 6.8 at 500 F. (See Fig. 1)

While pH is not the only factor influencing the selection of materials of pump parts, it may be stated that standard bronze fitted pumps should not be used for pH values below 6.00 or above 8.5 at the pumping temperature. Below 6.00, all bronze pumps or stainless steel fitted pumps should be used, while above 8.5, the pumps should be all iron or stainless steel fitted.

When two dissimilar metals are used in close proximity in a pump which handles an electrolytic liquid, severe corrosion may be expected to occur due to the galvanic cell action between the two metals immersed in the electrolyte. Therefore, the use of dissimilar metals should be avoided in centrifugal pumps when the liquid pumped is an electrolyte.

Galvanic corrosion is a rapid corrosion of a metal which occurs when the metal is electrically connected to a dissimilar metal in corrosive conditions. The combination of the two metals connected with each other and immersed in an electrolytic solution is the simplest form of an electric battery cell. The electrochemical reaction set up under those conditions causes electric current and small metal particles to flow from one metal to the other. These particles may become deposited on the second metal or else be washed away, due to the flow velocities in a centrifugal pump. The protected metal is the cathode and the corroded end is the anode of the two-metal cell.

If metals are arranged in the order of their relative tendency to corrode through galvanic action, the resulting tabulation is termed a "galvanic series."

The galvanic series presented in Table I gives an approximate idea of the interrelation of metals most commonly used in centrifugal pump construction. It does not include the various stainless steels used for pump parts as the position of these alloys in the series cannot be definitely fixed and has been known to change depending on the exact nature of the electrolyte. It is safe to state, however, that with weak electrolytes, they will occupy a position in the iron and chrome iron group and that the galvanic action between these materials is almost negligible.

The relative position of the listed metals is subject to some changes. However, changes across the spaces left blank between adjoining groups of metals are unusual.

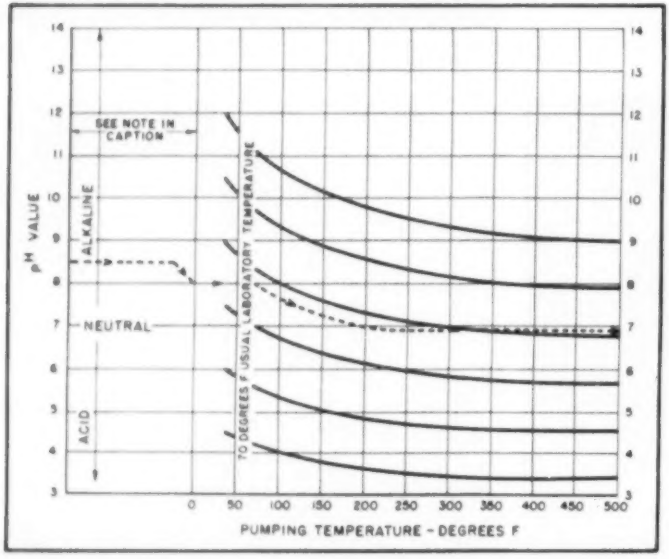



Fig. 1. **The effect of temperature on the pH value of liquids. A laboratory test for pH usually involves contact with atmosphere and is about 0.5 high, so deduct 0.5 from these readings in order to arrive at the correct values**

[1] Republication rights reserved by the authors.

[2] Part I of this three part series appeared in the December issue, Part II in the January issue.

**Table I. Metals, commonly used in centrifugal pump construction, are arranged here in the order of their relative tendency to corrode through galvanic action between dissimilar metals**

| Galvanic Series of Metals |
|---|
| Corroded End (Anodic) |
| Zinc |
| Iron<br>Chromium Iron<br>Chromium Nickel Iron |
| Tin<br>Lead |
| Brasses<br>Bronzes<br>Nickel-Copper Alloys<br>Copper |
| Protected End (Cathodic) |

While in many cases, the choice of materials can be made mainly from the point of view of corrosion and abrasion resistance, the structural features of a given pump part may play a definite role in the final material selection. Some parts, for instance, may require extremely thin wall sections and a material such as cast iron would prove to be unsuitable for these parts, even though it may be suitable from the point of view of corrosion. Other parts, such as shaft sleeves, require a high degree of polish and only materials which are capable of receiving such finish can be used for these parts.

Wherever the structural design features require the use of pressed-on or shrunk-on parts, the material used for these parts must be suitable for this method of mounting. For instance when pump impellers have to be shrunk on the shaft, bronze cannot be used and the selection is restricted to cast or stainless steel.

One of the important factors in the strength of metal castings is the relative uniformity of cross-sections of various portions of the casting. The more uniform these cross-sections, the stronger will be the casting and the less will be the possibility of internal cracks, inclusions, etc. An example of the inter-relation of structural features and material problems is shown in the construction of double suction impellers, Fig. 2. The central hub of double suction impellers is generally cored out—especially in the case of large impellers, in order to avoid the formation of a heavy cross-section which might lead to porous and imperfect castings.

It is obvious that the selection of metals which would give the longest possible life for a temporary installation would be very uneconomical. Thus, frequently standard fitted pumps may be applied on service where corrosion or erosion will wear the pumps out in relatively short time, since the pump would no longer be needed when it is worn out. The same reasoning applies to installations where the pump is operated extremely small percentage of the time, as long as contact with the liquid pumped during the idle periods does not continue the desintegration process or as long as the pump can be drained and flushed out.

On the other hand, where outstanding reliability is desired, the best materials are none too good, even if a pump is to operate but once in ten years. The best example of this is that of U. S. Navy pumps. The same considerations apply to pumps used on fire service, where dependability is of paramount importance.

There are two fields in which metallurgical advances have had a marked effect on the centrifugal pump design. These are the pumping of chemicals and the handling of boiler feed water. The selection of materials for centrifugal pumps handling chemicals is naturally dependent upon the particular liquid in question. This service is a very specialized field and those interested can generally obtain detailed information from those pump manufacturers who are actively engaged in the production of chemical pumps.

Boiler feed pumps are of more general interest and, as the selection of materials for this type of pump has been the most affected of all the general classes of centrifugal pumps by recent metallurgical developments, it may be interesting to discuss the present trends in boiler feed pump material selection.

Most boiler feed pumps designed for pressures of 800 psi and above are now stainless steel fitted, regardless of temperature or feedwater analysis. The application of stainless steel fittings, that is impellers, wearing rings, sleeves, etc., shows signs of extending to even lower presures. Today, it is almost mandatory under all pressure conditions for temperatures over 250 F and for all installations where the feedwater pH is either below 7.0 (neutral) or over 8.5.

Recent developments indicate that in addition to the use of stainless steels for the internal parts of centrifugal boiler feed pumps, stainless steel casings will be utilized to a much greater extent than heretofore. A definite impetus in this direction has been given by the recent findings of an investigation conducted by the Boiler Auxiliary Sub-Committee of the Prime Movers Committee of the Edison Electric Institute. This investigation was initiated to determine the cause of the rapid pump deterioration being experienced in many of the higher pressure power plants, a condition which had reached alarming proportions in the early forties. Among the various findings made by this Sub-Committee was the fact that stainless steels, 13 per cent chromium and better, are immune to the attack of any boiler feedwater so far encountered. The 5 per cent chromium 0.5 per cent molybdenum steel is apparently also immune.

Table II has been prepared as a

*(Continued on page 98)*

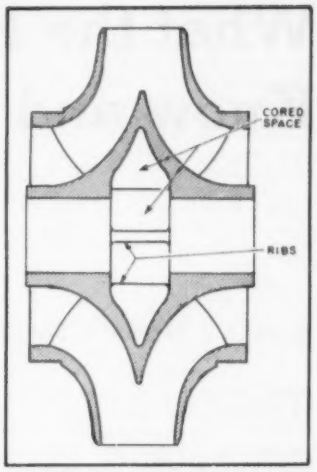



**Fig. 2. The central hub of double suction impellers is generally cored out to avoid large cross-sections which might lead to porous and imperfect castings**

**Table II. For use as a general guide in the selection of boiler feed pump materials**

| CASING | FITTINGS | MAX. TEMP. | USE |
|---|---|---|---|
| 1 Cast Iron | Bronze | 250 F | pH neutral to 8.5, unless water is known to have corrosive action |
| 2 Cast Iron | Stainless Steel | 350 F | Any pH, unless water is known to have excessive corrosive action |
| 3 Carbon Steel | Bronze | 250 F | Seldom used for boiler feed service today, and only where water is definitely known *not* to be corrosive |
| 4 Carbon Steel | Stainless Steel | 400 F | pH above 8.5, unless water is known to have corrosive action |
| 5 Stainless Steel | Stainless Steel | Any temp. normally encountered | Any pH and where water is corrosive or previous trouble reported. |

# What the Plant Engineer Should Know and Do About Lubrication

**Why lubricants fail . . . Over lubrication . . . Care of equipment . . . Lubrication charts . . . Selection of the lubricants . . . What you should know about operating conditions . . . Proper storage and handling . . . The five most common lubricant bases and why they are used**

By **JACK C. STEWART**, Plant Superintendent, Jesco Lubricants Co.

TOM JONES is the plant engineer. Equipment and machinery are in a good state of repair and problems of maintenance at a minimum. About the time Tom becomes accustomed to smooth operations, mutiny takes place in the guise of breakdowns. Maintenance becomes a serious problem, loss of production a nemesis, and, poor Tom immediately slips to the role of Court Jester.

Quite likely faulty lubrication practice was an important factor in the failure. Because a certain type of lubricant has been used for years does not necessarily mean it is best for the job. The Axle Grease and Hard Oil Age has passed, yet the engineer designs equipment, the fabricator builds it, then they turn and say "Lubricate it," with no further regard to capacity, method of application or varying operating conditions.

Breakdowns, bearing seizures or machine failures usually bring forth the dirge "The lubricant is no good." In many cases, the failure can be attributed to one or several of the following reasons.

**1. LUBRICATION**—It is a common practice to turn the lubrication over to just any employee or to the operator with indefinite instructions. If the plant engineer will stop and consider the investment in the equipment, and, the importance of proper lubrication, he will detail the job to an experienced employee, one who appreciates the value of, and loves, the sound of smooth running equipment.

Fig. 1. Twin gears which ran in a test to determine the effectiveness of lubrication. One failed after 105 min. The other was stopped after 4500 min with little evidence of wear. Can you guess which is which? Right! The one that was keeping bad company is pictured on the right

Fig. 2. Lubricant storage does not have to be elaborate or large but it should be clean and segregated from other materials which might contaminate it

Just because a compression cup is tightened, a lubricating gun is applied to a fitting, or, a dip stick is put in a gear box is no reason to assume the lubricating job is completed. The part to be lubricated should be checked to make certain it has received its share of lubrication.

Contrary to the belief of many, over lubrication is undesirable for it can cause trouble in the form of pressure, over heating and broken seals on bearings, as well as leaking on production materials and in general causing unsightly and untidy equipment.

**2. CARE OF EQUIPMENT**—In both large and small plants equipment represents the largest part of the investment and its care should be of primary importance. It should not be neglected nor remain unprotected. Dirt, metal particles, grit, chaff and abrasives can find their way into the parts to be lubricated and result in failures and breakdowns, costly repair bills and loss of valuable time.

It is not common knowledge that bearing seals are designed primarily to keep foreign materials out, not the lubricant in. By over lubrication these seals can be broken. The engineer should use his own ingenuity in perfecting guards and shields to protect the equipment in places where the designer failed.

For positive results each machine should have a chart on which the points can be checked off as they are lubricated, or, the points of lubrication counted and the number painted on the equipment. This number has a psychological effect inasmuch as it is human nature to count and compare, thus the points lubricated are checked with the count on the equipment and the element of doubt is eliminated.

It is a known fact that points of lubrication which are not easily accessible or are difficult to lubricate go unlubricated for extended periods of time to cause excessive wear and eventually failure.

The proper care of equipment and the importance of lubrication cannot be too heavily stressed. In the overall operation of any plant the lubrication man has a very important part.

**3. SELECTION OF THE LUBRICANT**—One of the most important factors is the selection of the proper lubricant. This in itself is the plant engineer's responsibility. With several instruments and a few instructions he can, so to speak, become his own lubricating engineer. At least he can know

**Fig. 3. Excessive heat did this to one roller bearing. In this case was the plant engineer or the lubricant to blame?**

his equipment to the extent he can discuss his needs intelligently with a salesman or lubrication engineer.

Speed of the equipment is one of the most important factors. This can be determined with the aid of a tachometer or stroboscope.

Size of the equipment in respect to bearings, gears, special drives, etc., can be determined by observation or inspection.

Operating temperatures must be determined, but this is a simple matter with the aid of a thermometer or pyrometer.

Climatic conditions and ambient temperatures must be considered, particularly when the equipment is operated in unduly cold or hot weather, or locations, or under variable conditions.

Wet or dry operating conditions (humidity and moisture) are important to determine whether water repellent or water soluble lubricant is best.

Metallurgy must be considered either from the standpoint of corrosion, or with some equipment such as gearing, where one type of metal meshes with another, abrasion and wear.

Each manufacturer has his own brand name but the specifications tell the story. With the information on requirements outlined above the lubrication engineer and the plant engineer can work together to develop a well rounded and closer relationship between the manufacturer and user of lubricants.

One point the plant engineer should not overlook is the tendency of the misinformed salesman to sell as many different lubricants as possible. The lubrication engineer or salesman from a reputable manufacturer will recommend one lubricant for as many jobs as practical, a point of some importance in reducing inventories and simplifying the storage problem.

**4. LONGEVITY OF MACHINERY**—Some plants, particularly those in operation 24 hr a day for many years, confront the plant engineer with a difficult problem. No equipment operating continuously under heavy load will last forever but its maintenance can be reduced and its life can be materially lengthened by proper attention. Equipment such as reduction gears, bearings, open gears, etc., even though well lubricated, will have a tendency to run hot due to friction when operated above rated capacity. One point which cannot be too strongly stressed is—a lubricant will not correct a mechanical deficiency.

**5. STORAGE AND HANDLING**—Little thought is given to this subject by the majority of users, but it is of primary importance. When a container of lubricant is open for use care should be exercised to prevent contamination with any foreign matter. For example, dirt or metal particles collected on the top of a lubricant can actually act as a grinding compound. Covers should be replaced on containers immediately after use. Containers should be kept in a room by themselves. A well kept room for lubricant storage is an asset to any plant.

It is the opinion of lubricant specialists that the human finger cannot test lubricants. It takes a well equipped laboratory with experienced chemists to analyze and place them in their proper classification.

Color of lubricants is the subject of much discussion but one point to remember is, that we manufacture lubricants from oils of different colors, or, dye them to suit the users, so color has little to do with the quality.

Quality of a lubricant can be determined by the type of base, the viscosity and kind of oil used and the method of manufacture. The most common bases used in the manufacture of lubricants are listed below:

**Aluminum base** is used primarily in the manufacture of transparent lubricants, used industrially to some extent, but more applicable to automotive and farm operation. This base is also used in the manufacture of recoil lubricant for recoil mechanism in large guns.

**Calcium base** is the most diversified and commonly used of all lubricants from a fluid to a heavy solid, and are applicable to industrial operation.

**Lithium base** is one of the newer developments in the lubricant industry and can be truly called an industrial lubricant because of its unusual stability and successful performance.

**Lead base** is used to some extent in the manufacture of semi-fluid to solid lubricants although it is used primarily for fluid types of lubricants for all phases of gear lubrication.

**Sodium base** lubricants are usually of a fibrous nature and range from a fluid type gear lubricant to a wheel bearing or heavy driving journal lubricant.

Many types of fluid lubricants on the market today contain additives. The contents of these additives are the secret of the manufacturer. They are used primarily as extreme pressure, anti-rust, and anti-foam agents and are purchased by the manufacturer according to his experience, or, at the request of the customer that a certain type be used in his products.

## Plant RR Tracks Laid Over Concrete

**Contributed by H. R. Clark, Project Architect, Westinghouse Elec. Corp.**

WHEN OUR COMPANY took over the Curtiss-Wright plant in Buffalo it was necessary to increase railroad trackage to the west and north sections of the plant. This extension of trackage from the central receiving area to the western end of the building ran over the large concrete apron formerly used to store planes.

The expense invloved in breaking out this pavement and re-laying the track in concrete seemed out of proportion to the advantage gained by this type of installation. Therefore, the track was located as shown in the photograph. Cinder ballast was laid directly on top of the concrete and the ballast was confined at the edges with creosoted ties thoroughly lagged into the concrete.

**The aircraft plant's concrete runway was a problem when it came to running railroad sidings. Solution: cinder-ballasted tracks with ties holding the ballast.**

# Water Services—No Pipe Dream!

## 1. Calculating Cold Water Pipe Sizes and Capacities

**Principles of water system calculations . . . The two types of systems, up-feed and down-feed . . . Estimating water quantities with charts and tables . . . Pipe sizing with brass, copper and galvanized iron . . . Figuring equivalent length of piping . . . Branch size calculations . . . Method of pipe size computation from available pressure drop data . . . Hot water system calculations to appear in future article**

By **ROBERT K. COLLIER**, Mechanical Engineer

MOST PLANT ENGINEERS now have complete control of new structure design or alteration of existing buildings. Others, though they do not control design, are responsible for checking submitted plans.

Since an adequate water flow is necessary for satisfactory operation of all industrial buildings, plant engineers should be familiar with water system calculations. Principles can be understood by a brief look at a typical problem which is presented in detail farther on in the text.

**System type:** Either an up- or a down-feed system, Fig. 1, can be used for cold water supply. Type of system used depends, usually, on height of the structure and water pressure available in the street mains.

The up-feed type of system is most commonly used in low structures of one or two stories. Street mains can then supply the needed pressure at the highest fixture in the building. Where the street main pressure is insufficient to produce desired flow from highest fixture, the down-feed system is used. Water is raised to the roof tank by means of a pump located in the basement.

Up-feed systems require less pipe and fittings than down-feed. They are therefore more desirable from an economic standpoint but their lower cost should never be the sole criterion in system choice. Dependability of performance is of greater importance than initial economy, especially when process units are served by the system.

**Demand Load:** The amount of water which must be supplied to any system is a function of the number and type of fixtures installed and how they are used. To estimate water quantities, Table I and Fig. 2 are used. Figures given are the result of a number of studies made in typical buildings. The demand load, or required water flow, for a group of fixtures used intermittently is determined by: 1 finding the product of the number of each type of fixture and the "weight" from Table I, and; 2 entering Fig. 2 with the sum of these products to find the necessary water flow.

Fixtures considered above are of the intermittently operated type, such as faucets and flush valves. Demand loads for other fixtures, and those which require a continuous supply of water, must be calculated separately.

Some examples of this type are hose outlets, process supply pipes, and air conditioning apparatus supplies.

**Pipe Sizes:** Brass, copper and galvanized iron piping are generally used for cold water supply. Pressure losses for brass and copper pipe are as given in Fig. 2. With galvanized iron pipe, pressure losses when new will be about equal to those for brass

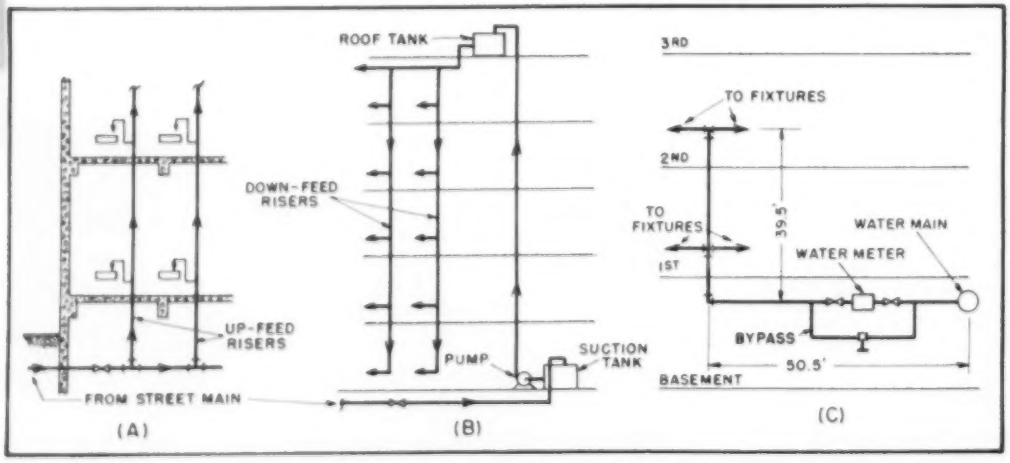
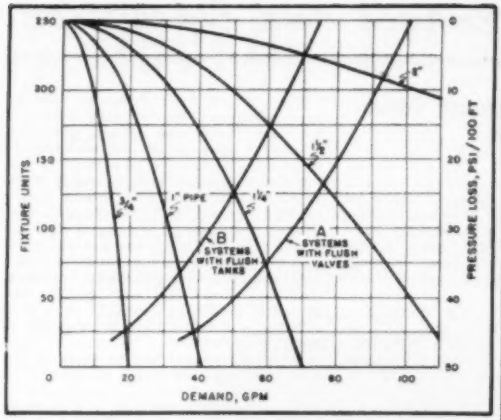



Fig. 1. A—Up-feed system for cold water supply to an industrial water system. B—Down-feed system using a tank in the pump suction line and a roof tank. C—Up-feed system used in illustrative example in text



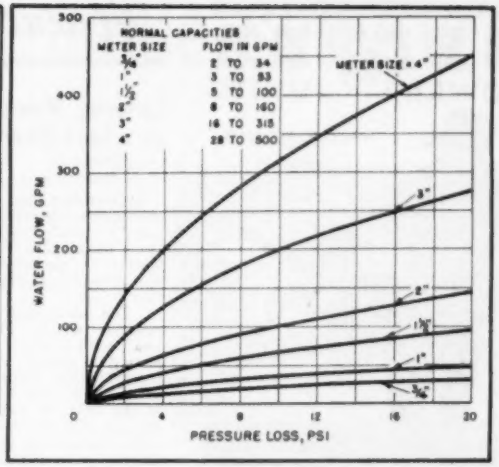




**Fig. 2. Above: For calculating demand load, pressure losses**
**Fig. 3. Hydraulic characteristics of typical water meters**

and copper. However, after a number of years, corrosion and other factors will reduce internal diameter and increase pressure losses. To allow for this condition when sizing iron piping, a flow rate 35 per cent greater than actually needed is assumed. A 50 per cent increase is used for waters containing lime and minimum branch line size used is ¾ in.

Besides the pressure loss in straight piping, there is also a loss in ells, valves, and tees. Table II gives the equivalent length of straight pipe for various fittings used in cold water systems.

**Typical Example:** Application of these data is best shown by a typical example. The example will also aid in understanding the various pressure relations which must exist in cold water piping systems.

An industrial plant located in a city where the minimum street pressure is 60 psi has its highest fixture 39.5 ft above the main. Total number of fixture units installed is 75; water closets are flush-valve operated; length of brass piping between main and top of riser is 90 ft. Determine riser and branch sizes for the arrangement shown in Fig. 1C.

**Solution:** With 75 fixture units installed, demand load from Fig. 2, Curve A, is 60 gpm. Since a water meter must be used, the pressure loss through it should be computed first. From Fig. 3 it is seen that a 1½ in. water meter is the smallest which will pass the required quantity of water. Also, a pressure loss of 9 psi occurs when the meter passes 60 gpm.

To properly operate usual flush valves, pressure at the fixture should be 15 psi; for other fixtures, an 8 psi pressure is sufficient. Difference in elevation between main and highest fixture causes a pressure loss equal to the product of distance in feet and 0.43. Assuming a 15 psi pressure at the highest fixture, pressure drop available for overcoming pipe friction is $60-(15+39.5\times 0.43+9.0)=19$ psi. In other words, subtract from street main pressure the sum of the pressure required at the highest fixture, pressure loss caused by difference in elevation, and water meter loss. The result is the pressure available for overcoming pipe friction.

Once the available pressure drop is computed, the pipe size can be found if the total length of pipe, including fittings, is known. However, since only the length of straight pipe is known, the equivalent length of fittings must be assumed. After the pipe size has been selected, actual equivalent length of fittings can be computed and compared with the assumed figures. Any necessary corrections can be made at that time.

Thus, assuming an equivalent length of 35 ft, total equivalent length of piping = 90 + 35 = 125 ft. To express pressure loss in the usual terms of psi/100 ft, allowable loss = 19(100/125) = 15.25 psi/100 ft, say 15. Referring to Fig. 2, a 1½ in. diameter pipe is satisfactory. Assumed equivalent length of fittings is now checked against the actual length to see if the two agree. Should the actual length be greater than assumed, pipe size must be altered accordingly.

Branch size calculations are summarized in Table III. Study of this table shows that there is little difference between riser and branch calculations. Although the system described here is of the up-feed type, down-feed systems are designed in a similar way. The elevated tank supplies the necessary pressure instead of the main.

**Other Fixtures:** Hose bibb, process fixture, and air conditioning water quantities were neglected in the above example but if they were used, the quantities needed would be added to the demand load before determining pipe size. Note that the water quantity computed in this article does not represent the total consumption of the building. Fire protection, process, and hot water loads will further increase building demand.

**Table I. Industrial fixture demand weights; used in conjunction with Fig. 2**

| Type of Fixture | Demand Weight |
|---|---|
| Water closet—flush valve | 10 |
| Water closet—flush tank | 5 |
| Wall or stall urinal—flush valve | 5 |
| Wall or stall urinal—flush tank | 3 |
| Lavatory—faucet | 2 |
| Shower—mixing valve | 4 |
| Service sink—faucet | 3 |

Note: Where both hot and cold water are supplied to a fixture, demand weight can be taken as 75% of the listed figure.

**Table II. Equivalent length, in feet of straight pipe, of fittings, valves**

| Pipe size; in. | 90° elbow | 45° elbow | Tee | Gate valve | Globe valve |
|---|---|---|---|---|---|
| ½ | 2 | 1 | 1 | 1 | 17 |
| ¾ | 2 | 1 | 2 | 1 | 21 |
| 1 | 3 | 1 | 2 | 1 | 29 |
| 1¼ | 4 | 2 | 3 | 1 | 38 |
| 1½ | 5 | 2 | 3 | 1 | 45 |
| 2 | 5 | 3 | 3 | 1 | 58 |
| 2½ | 7 | 3 | 5 | 2 | 68 |
| 3 | 8 | 4 | 6 | 2 | 82 |
| 4 | 11 | 5 | 7 | 2 | 115 |

Note: These figures are for screwed fittings only.

**Table III. Fixture weights for use with various branch pipe calculations**

| No. and Type of Fixtures | | Fixture Weight |
|---|---|---|
| 2 WC flush valves | 2(10) = | 20 |
| 3 Shower mix. valves | 3(4) (0.75) = | 9 |
| 2 Lavatories | 2(2) (0.75) = | 3 |
| Total Fixture Units | = | 32 |
| Demand (Fig. 2) | = | 40 gpm |
| Pipe size (Fig. 2) | = | 1¼" |

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# *Maintenance and Operation*

## Lowering Maintenance Costs on a Sand-Mixer

Contributed by
H. B. McDermid

SAND-MIXERS can present quite a maintenance problem. In one particular case, a foundry was constantly harassed by a crust which formed at the bottom of the mixing bowl, causing breakdowns requiring replacement with new parts.

The sand-mixing was done in a machine which looked like a large bowl, with a heavy vertical shaft projecting up through its center. This shaft carried heavy scrapers on appropriate arms which clean the sides and bottom of the bowl as well as to thoroughly stir and mix the sand.

The sides of the bowl were lined with sheets of rubber and neither the scrapers nor the lining, at that point of contact, gave much trouble. The bottom of the bowl, however, was of hard metal and the scrapers were set to clear it by the closest practical clearance that could be maintained. Should that clearance be accidently increased, a hard gritty scale would start to stick to the bowl bottom and would rapidly pile up and spread until the scraper mechanism was supported on it entirely. If this were not detected and the machine shut down for a complete cleaning with pneumatic hammers (nothing less did any good), the scrapers would be damaged in a few minutes and would have to be replaced with new parts.

Since the proper maintenance of the sand-mixer would mean an even flow of plant operations, it was necessary to delve into the problem and attempt a solution. The company had to determine just what took place under the 6 ft diameter pile of flying sand a foot deep.

*(Turn to page 62)*

## Automatic Extinguishing System at Paint Plant

FIRE HAZARDS at Nubian Paint & Varnish Co., Chicago, which involve the mixing and reducing of flammable paint chemicals, are believed to have been neutralized to a great extent by an automatic system of protection recently installed.

Main source of supply of carbon dioxide for the system is 20 steel storage cylinders, each containing 50 lb of liquid $CO_2$. It is distributed by piping to high rate discharge nozzles strategically located in fire hazard areas. The latest in automatic controls is tied in with the gas discharge. Fire can be detected almost the instant it starts in any protected area by rate-of-temperature-rise actuators. These are connected by copper tubing to special discharge heads on cylinders through which the carbon dioxide is released into the distribution piping.

As the gas rushes through the piping under its own power, to the proper area as controlled by directional valves, it actuates pressure-operated trips which close doors, windows and ventilating ducts and cuts off all outide air flow. At the same time, automatic, explosion-proof switches shut off power to electrically driven machinery. System installed by Walter Kidde & Co.

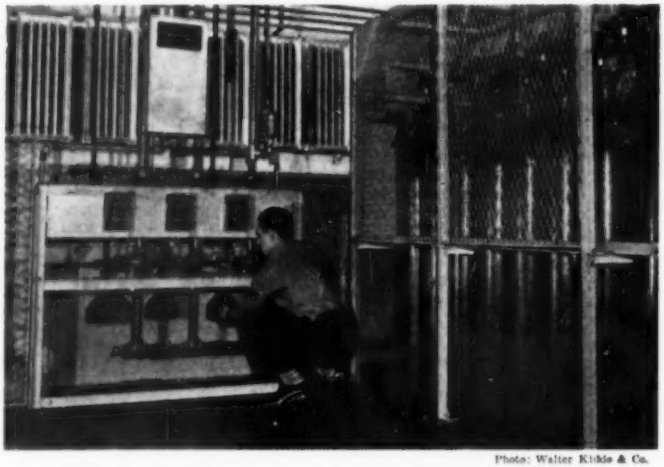
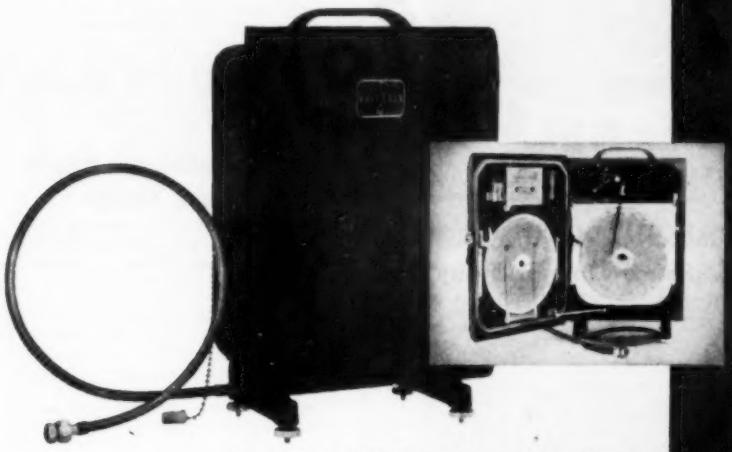


Photo: Walter Kidde & Co.

**This three-way directional valve frame automatically routes discharging carbon dioxide to space where fire strikes. Valves of storage cylinders, right, open automatically when heat detectors in protected areas signal fire**

# ...Hookup for trouble-shooters

Portable pressure gauges like this are used for testing and trouble-shooting. They must be easy to connect and disconnect quickly. The connecting tubing must remain tight despite severe and repeated flexing and abuse.



*Bristol Series 500 Recording Pressure Gauge fitted with American Flexible Metal Tubing, synthetic covered.*

In this case, the American Flexible Metal Tubing carries the medium tested (gas, vapor or liquid), instead of serving as armor over capillary tubing. The illustrated full interlocked flexible metal tubing, synthetic covered, meets this complicated and difficult assignment with ease and assurance.

There is a style of American Flexible Metal Hose and American Seamless Flexible Metal Tubing to convey nearly every fluid or gas over widely varied conditions of temperature, pressure or mechanical stress. For full information, write to The American Brass Company, American Metal Hose Branch, Waterbury 20, Connecticut. In Canada, The Canadian Fairbanks-Morse Co., Ltd.

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Persistent study and plenty of experiments finally established the fact that: when the clearance between the scrapers and the bowl bottom deviated, the sand would pile up in scales. These scales were thick enough to withstand the weight of the revolving parts without cracking away from the metal of the bowl bottom. They would continue to thicken and pile up until the whole weight of the revolving parts was riding on sharp abrasive sand with plenty of power to force the grinding action. From this point on it took but a few minutes to completely ruin a set of blades.

The job of attempting to set up an improved method of maintenance for the sand-mixing scrapers was turned over to one of the employees. He carefully made a templet of the proper shape of the scraper edges to be used as a guide for grinding them to correct lines. Then he took a welding torch and laid a surface of the hardest alloy obtainable upon the working surfaces of a set of scrapers. The hard surfaces were then ground to shape.

## Capacitor Installation Effects $2700 Annual Savings

THE EMPIRE PLOW Company, Cleveland, through a recent installation of four capacitors, effected an immediate increase of more than 30 per cent in their power factor. According to estimates, under the existing utility rate structure, the installation will pay for itself in eight months.

The installation was made in January, 1949, in a bank of four capacitors, two 90 kvar and two 30 kvar, on the plant power distribution system. As a result, the plant power factor was increased from about 61 per cent to an average of 97.3 per cent over a period of months.

The total cost of installation, including capacitors, switches and installation charges, was $1907. Empire Plow engineers estimate that the saving this year on power costs due to the increase in power factor will amount to $2700.

Photo: General Electric Co.

**One of the four capacitors installed in the plant of Empire Plow Co.**

# Cancelling "Holidays" in a COATING'S CALENDAR

Look closely at the picture above, and you'll see a spark jumping from the metal test panel to the electrode in the technician's left hand.

That means the coating on the panel is not in a continuous film or is broken . . . protection thereby is not complete. We say the coating has a "holiday" in it.

Sometimes these "holidays" aren't visible to the naked eye. So Flintkote researchers use this method of testing electrically to be *certain* that the coatings tested meet the conditions for which they were formulated. When the tell-tale spark appears . . . back the coating goes for further development until it passes every test with flying colors.

And this is only one of literally hundreds of painstaking tests that Flintkote researchers make on every product. Housed in one of the most modern, efficiently equipped buildings in the industry, the staff of this new research laboratory sets the pace for Flintkote plants from coast to coast . . . to assure better products and better results consistent with lowest possible costs.

Whether your problem is one of coatings for sound deadening, protection from water or weather, fume resistance or acid corrosion . . . adhesives or floorings . . . see what we have now and can offer you for the future.

**THE FLINTKOTE COMPANY**
*Industrial Products Division*
**30 Rockefeller Plaza, New York 20, N. Y.**

**FLINTKOTE**
*Products for Industry*

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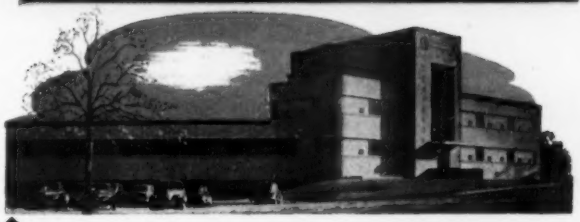
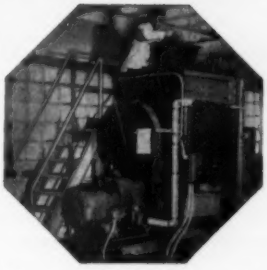


⬆ One or more of 24 separate laboratories constantly evaluate Flintkote products step by step from raw materials to field performance, from initial development to mass production. Both Company and Customers profit by this *insurance from research.*



This "pilot scale" ribbon type mixer ➡ enables the laboratory to reproduce production conditions quickly and accurately for research and testing of a variety of asphalt mastics.

⬅ Scientific equipment in use here permits complete analyses when only minute quantities, sometimes no larger than a pinhead, are available. Techniques like this assure purity, reduce cost, speed operation and increase accuracy in the Flintkote Laboratories.

This small scale rubber mill is used to ➡ break down various rubber materials to just the right consistency for use in new products or processes. Full size operation follows in the production of versatile fluid rubber and rubber-like adhesives, coatings and sealers.

ld
manual of
lighting application data
BENJAMIN
• Benjamin Electric Mfg. Co., Des Plaines, Ill.
SYSTEM 5
High-Bay Combination Units
A system of combination mercury and incandescent units for providing illumination levels from 20 to 50 footcandles.
SYSTEM 7
RLM "Shield-Flo 40"
A system of individually-spaced, specially shielded, closed-end fluorescent units, providing from 20 to 50 footcandles.
SYSTEM 10
"Magna-Flo 75"
A high light output system of fluorescent units, providing from 40 to 70 footcandles.

# NEW BENJAMIN MANUAL Shows How You Can Employ The *12* Benjamin Lighting Systems To INSURE GOOD PLANNED LIGHTING

SYSTEM 11

"Lite-Line" System

A continuous channel system of fluorescent units, for providing illumination levels from 50 to 100 footcandles.

R-4058-B

This manual brings you the principles and data needed to develop good planned industrial lighting installations. It shows you how to insure success of planned lighting through the proper application of the 12 basic Benjamin Lighting Systems.

These 12 Benjamin Systems enable you to meet, with a suitable lighting system or systems, the varied seeing tasks and environmental conditions involved in industrial lighting.

The Benjamin Manual of Lighting Application Data shows how the 12 systems can be used to provide required illumination levels from 10 to 150 footcandles; how they can be applied to specific lighting problems; how the use of the 12 systems, as outlined in the manual, simplifies planning and helps to determine the selection of the system or systems best suited to the specific requirements.

For your complimentary copy of this "Manual of Lighting Application Data," fill in and mail the coupon or write to:

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# Data File and Library

**STANDARD CATALOGS, bulletins and handbooks are listed here to aid plant engineers in maintaining a permanent data file. Unlike the recently-published literature listed in the Helpful Bulletins on Current Plant Problems section, these publications will be listed monthly, as long as available, except for additions and deletions determined by space requirements. Use the Helpful Bulletins postcard in requesting copies of these publications.**

## VALVES

**201 Valves and Specialties for Corrosive Services**—Gate and needle valves, screw machine products, hose nipples, tubes, flanges, hot rolled bars and welding electrodes described in Bulletin W-350-35B are made of Worthite, a stainless alloy produced for company's in equipment for handling various corrosive solutions. Gives sizes, specifications for equipment listed, includes photos. Worthington Pump and Machinery Corp.

**202 Blow-Off Valves**—Bulletin B-424 is a 24-pp catalog covering blow-off valves for low and medium pressure boilers. Describes and illustrates construction details for seatless valves and double-tightening valves. Includes specifications, dimensions, weights and prices on valves and parts. Pictures many installations. Yarnall-Waring Co.

**203 Gate Valves**—Specifications, sizes, and dimensions for bronze gate valves of heavy duty construction for use on steam, water, oil, or gas lines are provided in pocket-size Circular 102. Brief text discusses maintenance, installation and operation. Illustrations show screwed and bolted bonnet types, design features. The Kennedy Valve Mfg. Co.

**204 Reducing Valve Engineering Data**—Bulletin 962 presents data on pressure reducing valve, explaining how its streamlined contour contributes to efficiency of performance. Discusses and illustrates valve's straight-line flow, wide opening, tight closing and other design features. Includes sizes, dimensional data and steam and air capacity charts. A. W. Cash Co.

**205 Air Control Valves**—Folder A illustrates 20 air-controlled valves, showing two-way, three-way and four-way air flow and indicating open, closed and exhaust positions. Text briefly covers special design features, sizes, basic types, capacities and available metals. Valvair Corp.

## MATERIALS HANDLING

**206 Overhead Handling Equipment**—In Bulletin C-1, 56 pp, are more than 100 photos of overhead handling equipment in use in all types of industries. Sketches of trolleys, cranes, switches, track and auxiliary equipment show construction, safety features, electrical advantages. Book also discusses engineering services offered. Includes data sheet for requesting information on special problems. The American Monorail Co.

**207 Industrial Jacks**—Catalog 50 is a 28-pp ordering book covering single acting ratchet lowering jacks, track jacks, screw jacks, hydraulic jacks, push and pull jacks, reel jacks and related equipment and accessories. Gives sizes, capacities, weights; tells applications. Templeton, Kenly & Co.

**208 Materials Handling Equipment**—Catalog 23, 90 pp describes most types of company's power trucks, power jacks, stackers and cranes, hand trucks, platforms and storage racks, and related equipment. Fully illustrated with photos and drawings it includes specifications, capacities, sizes and application data. Lewis-Shepard Products Inc.

**209 Handling and Processing Equipment**—Catalog 791, 32 pp, presents line of feeders, bin valves and level indicators, reduction machinery, vibrating screens and processing equipment, magnetic separators, elevating and conveying machinery, barrel packers, electrical controls for vibrating units, also chains and transmission machinery. Illustrated with photos and sketches of units and installations. Gives typical applications and advantages of equipment, explains operation, includes specifications, sizes. The Jeffrey Mfg. Co.

**210 Conveying Systems Manual**—Unloading and conveying of dry pulverized material are discussed in 24-pp Bulletin FK-25. Text covers complete system and its operation, also stationary pump and related equipment and is illustrated by photos and dimensional drawings, with sizes listed. Several installations of conveying equipment are described and pictured. Also presents an air compressor for use with conveying systems, and remote-control unloader. Fuller Co.

**211 Electric Hoists**—Catalog H-46 is a 44-pp manual covering monorail and stationary hoists and car pullers and providing helpful information on fundamental types of grabs, methods of hanging I-beams, types of hoist suspension, types of controls and factors to be considered before ordering. Contains full specifications and dimensional data, illustrations of models, many photos of installations. American Engineering Co.

**212 Freight Elevator Buyer's Guide**—How to integrate selection of freight elevators with materials handling needs is among questions answered in Booklet B-4402, 44 pp. Ten illustrated sections explain basic considerations involved, also component parts of freight elevators. Covers lifting capacity and size; control systems; methods of door operation; layouts for standard freight elevators; types suited to plant needs; budget price information, and typical and special installations. Elevator Div., Westinghouse Electric Corp.

**213 Conveyor and Elevator Belting**—Full engineering data covering company's line of belting for conveying jobs and industrial elevator installations are provided in this 24-pp illustrated handbook. Also describes and gives application information and specifications for these beltings. Technical data is clearly presented so as to simplify selection and ordering. Republic Rubber Div., Lee Rubber & Tire Corp.

**214 Swing Boom Cranes at Work**—Bulletin 98 tells how company's swing boom crane cars of 1½ to 10 t capacity cut materials handling costs in the steel metal working and metal producing industries. Photos show the mobile cranes handling scrap, loading railroad cars and trucks, working in narrow aisles, and text describes other indoor and outdoor jobs handled. Silent Hoist & Crane Co.

## COOLING, AIR CONDITIONING HUMIDIFYING

**215 Conditioning Units**—The advantages of self-contained conditioning units and their applications in cooling, dehumidifying and cleaning are given in illustrated Catalog 1307, 40 pp. Explains installation and operation. Includes complete engineering data on direct expansion cooling, cold water cooling, hot water heating, steam heating. Also includes speed and horsepower tables, dimensional data on both horizontal and vertical types, psychometric chart and typical problems involving choice of unit size, number of rows of coils, determining speed and motor horsepower. Clarage Fan Co.

**216 Humidifiers**—Illustrated Bulletin 1772 covers line of steam humidifiers, including two new air-controlled models. Includes discussion of dry air problems, tables on desirable relative humidities and regain of hygroscopic materials, complete data on operation and installation of both electric and air-controlled types. Also tells how to select humidifiers, giving capacities and prices. Lists and illustrates air-operated and solenoid-operated valves for use in humidifier control. Armstrong Machine Works.

**217 Cooling Towers**—Section 42 covers induced draft cooling towers for small water-cooled air conditioning and refrigeration condensing units. Illustrates towers and pumps, and discusses applications, operation and installation of the towers, giving specifications. Includes typical installation diagram, capacity and performance tables, also tower and pump selection table. Binks Mfg. Co.

## ELECTRICAL

**218 Motor Data**—Bulletin MU-185 is a collection of more than 60 pp of engineering and descriptive data on company's line of motors. Covers many types, including splash-proof and explosion proof motors, gear motors and motors intended for use in chemical plants, for oil well pumping, punch press motors, elevator, crane and hoist motors. Illustrated throughout; includes price lists. Wagner Electric Corp.

**219 Voltage Control**—Bulletin 547, covering variable transformers and voltage regulators, illustrates and describes available models, stressing their special features and including specifications, dimensional data, ratings and connection arrangements. Also presents electronic electro-mechanical regulators. Includes price list. The Superior Electric Co.

**220 Selenium Rectifiers**—Booklet DB-19-025 on standard and high-voltage selenium rectifiers for power supplies and electronic circuits gives efficiency curves for both types, together with discussions on efficiency and service life, back leakage and reverse resistance and forward resistance. Life characteristics of both cell types for various overload conditions or high ambient temperatures are plotted graphically. Includes tabular presentation of schematic diagrams, formulas for calculating rectifier performance, and cell ratings. Westinghouse Electric Corp.

**221 Capacitor Motor**—Bulletin GEA 5401 presents integral horsepower, single-phase capacitor motor, illustrating and discussing its compact size, transfer mechanism, bearings, and terminal board. Emphasizes long service and protection against damage, breakdown and operating wear afforded. Also stresses motor's easy installation and quiet operation and explains company's motor exchange plan. Gives specifications, characteristics of motor, and elaborates on construction features. Apparatus Dept., General Electric Co.

**222 Power Distribution Feeders**—Catalog TEB-1, 40 pp, is devoted to heavy-duty units used as main feeders in company's power distribution system, giving construction details, engineering data, application tips. Includes comparative analysis between this and other methods of power distribution on basis of cost and performance. Also contains full listing of parts, telling how to specify, order and install equipment. The Trumbull Electric Mfg. Co.

**223 Volt Ammeter**—A seven-range, clip-on volt ammeter is discussed as to design and use in illustrated List In. 17V. Explains special features in detail and includes dimensional data, price. Ferranti Electric, Inc.

**224 Planned Lighting Guide**—This selection guide features a chart which enables reader to see at a glance the application of each of company's 12 major lighting systems, covering practically every seeing task with illumination requirements from 10 to 150 ft-c. Another chart covers special lighting units for use in locations with combustible, dusty or damp atmospheres. Tells what to look for when ap-

**THE STORY BEHIND INDUSTRIAL FLOOR SAFETY THAT COMPLETES THE PICTURE!**

Production crews work on plant floors that are carefully kept safe and slip-resistant—

—While highly-paid engineers and executives walk on administrative floors that are slick, slippery hazards!

Yes, old-fashioned methods of waxing expensive administrative floors still persist—methods responsible for up to 95 out of 100 slip and fall accidents! For old-style waxing was designed to protect floors—not people!

Many leading firms now have underfoot safety for *all* floors with the Legge System of Safety Floor Maintenance. Legge was first with floor polishing that is slip-resistant, first with *safety engineering* of floor maintenance, first to be listed by Underwriters' Laboratories. Casualty insurance companies widely recommend the Legge System.

Legge floor safety products give you polished safety on administrative flooring, and specific slip-preventatives for common plant floor safety problems. And Legge Safety Engineers teach your crews how to keep floors safe, how to prevent slippery walkways—a service that's *free* with your use of Legge products.

Learn now how the Legge System can give you equal slip-resistant protection for *all* your floors. For informative literature, clip the coupon to your letterhead and mail. Walter G. Legge Co., Inc., New York 17, N. Y. Branch offices in principal cities. In Canada, J. W. Turner Co., Toronto.

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praising lighting equipment and a check list of benefits derived through proper application of planned lighting to industrial operations. Benjamin Electric Mfg. Co.

**225 Precision Switches**—Catalog 81, 20 pp, covers industrial switches for a-c circuits. Describes and illustrates general purpose basic switches, reset basic switches, auxiliary actuators, enclosed switches, explosion-proof and splash-proof types, limit switches and extra small switches. Includes full ordering information, technical data and definitions, price list and discount schedule. Micro Switch.

**226 Answer Card**—Rules of thumb for answering questions on capacities and applying power-factor-improvement are printed on a double card small enough to fit in plant engineer's wallet. With this card he can quickly compute the answers to the questions: How many kilovars? What power factor? How much voltage rise? Simplified diagrams illustrate formula for quick computation. Apparatus Dept., General Electric Co.

**227 Power Transformers**—Bulletin TU-181, providing more than 108 pp of descriptive and technical data, contains sections on power transformers and unit substations of both dry and liquid-filled types, on transformer performance and on company's transformer manufacturing facilities. Text is fully illustrated. Wagner Electric Corp.

**228 Switch Tips**—This is a regularly issued publication filled with good ideas and helpful suggestions on use of company's snap-action switches. Will be mailed to plant engineers who request it. Micro Switch.

## MECHANICAL POWER TRANSMISSION

**229 Flexible Couplings**—Catalog FC-50 describes and illustrates roller chain flexible couplings for direct power drive applications stressing design features. Includes selection data, ratings, dimensions. Also includes descriptive and ordering information on coupling covers. Whitney Chain & Mfg. Co.

**230 Transmission Belting Manual**—Answers to most of the questions on transmission belting are provided in this 28-pp book. Illustrates company's beltings, gives specifications, tells how to select correct type for the job; also how to order belting, install it and maintain it in good operating condition. Filled with technical data, including comparisons, usefull formulas, tables of belt speeds, overload and correction factors. Republic Rubber Div., Lee Rubber & Tire Corp.

**231 Chain Drives**—Engineering Catalog SCE-50, 68 pp, provides data on company's silent chain drives, giving their advantages, recommended applications. Also gives information on chain length calculation, installation and maintenance, dimensions, ratings, prices. Actual-size photos illustrate chain types, pitch. Includes full ordering data on sprockets.

Catalog CR-48, 16 pp, contains similar information on company's roller chain drives. Both books are available; ask for either or both. Whitney Chain & Mfg. Co.

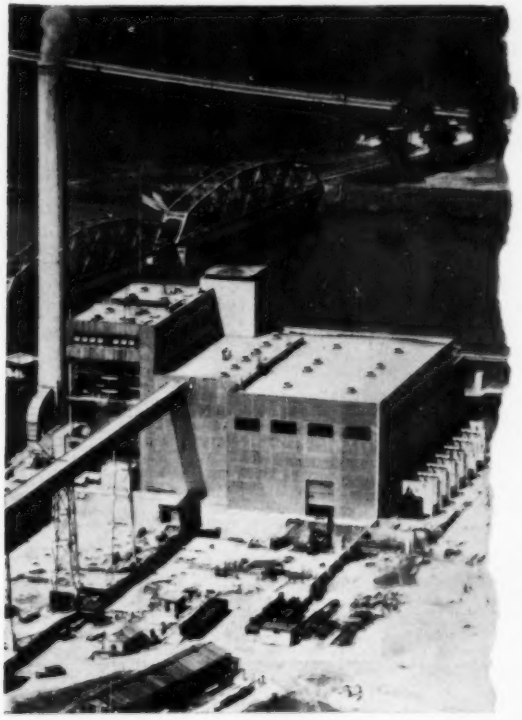
## PUMPS, COMPRESSORS

**232 Centrifugal Pump Care**—Sixteen-pp Bulletin 08X6256A is a revised handbook on the care of all makes of centrifugal pumps, giving the how and why of pump construction and their effect on pump maintenance. This informative booklet tells how to figure head and it carries tables to help determine friction loss. Causes and cures for various sources of troubles are offered along with a new maintenance timetable. Also included are little known facts about cavitation and how to protect pumps against it, water's role as a pump lubricant, common mistakes in packing stuffing boxes. Allis-Chalmers Mfg. Co.

**233 Turbines, Pumps, Compressors**—Bulletin 1181A provides an over-all presentation of company's line of steam turbines, centrifugal pumps, multi-stage pumps, and pumps specially designed to handle viscous fluids and oils, as well as blowers and compressors, and worm gear speed reducers. Includes photos of models and installations, cutaway illustrations and sectional

# How to Make Power Plants

# S-t-r-e-t-c-h-a-b-l-e



Courtesy of The Dayton Power and Light Company, Dayton, Ohio. This structure includes 139 squares of steel Fenestra Type C Panels and 142 squares of aluminum "C" Panels. *Engineers:* Ebasco Services, New York City. *Contractor:* Owner.

Power plants must be *expandable.* So—if the future demands it—walls can stretch out to hold added equipment, i.e: The right wall of Fenestra* "C" Panels in the building shown here was moved recently and will be moved again soon.

Are you designing buildings where the easy dismantling of these good-looking panels would be an important factor in the future moving of the buildings or in rearrangement of curtain walls?

Where the installation speed of Fenestra Panels can help get equipment under cover quickly . . . economically . . .

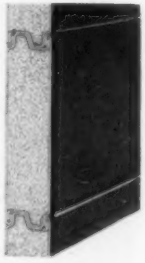
Where noncombustible walls are needed—lightweight walls of great strength that lessen the requirement for structural steel . . .

Where, instead of a 12″ brick wall, you could have "C" Panels with their 3″ layer of enclosed Fiberglas insulation . . . and save money . . .

Where walls should be so smooth that dirt and grease can't get a grip?

### What Fenestra Insulated "C" Panels Are

"C" Wall Panels are standardized in 3″ depth and 16″ width, in 18 gage painted steel or 16 B&S gage aluminum. Steel panels vary from 6′ to 14′ in length, weigh only 6.50 lbs. per sq. ft. Aluminum only 3 lbs. Made from two formed members, joined to form a structural unit. Asphaltic impregnated felt is inserted inside the full length to prevent metal-to-metal contact. Double tongue and groove joints make a wall of "C" Panels an integral load-bearing unit. There are 3 positive bearing surfaces per panel. This eases erection, vertical or horizontal. Each panel is vapor sealed, with felt stripping between the formed sides and end closures. Smooth surface permits easy flashing details. Note: In the illustration, the left edge is the outside.



See Sweet's Engineering File—Section 5c/3, mail the coupon, or have one of our engineering representatives call. Also ask about "D" Panels for floors and ceilings, and Holorib Roof Deck.

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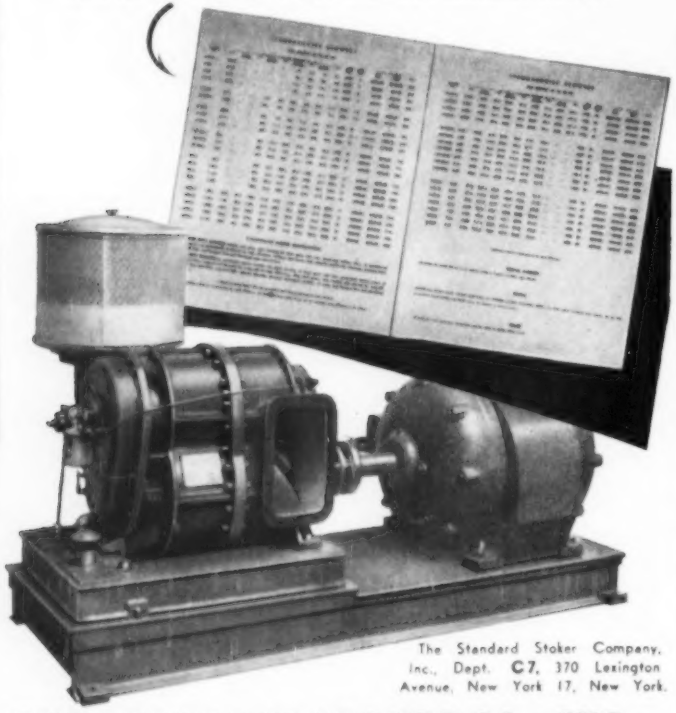
## PRECISION BUILT
## *Axial Flow* BLOWER

To meet specific and variable pressures, Standardaire Positive Displacement Blowers are built in a series of sizes to fulfill a wide range of capacity requirements from directly connected, standard speed motors—the modern method of producing just the amount of air required at the minimum cost. Direct-drive motor speeds also provide for an even air flow resulting in smaller pulsations that are easy to dampen out and do not create shock loads in the blower or delivery system. If the type of service demands other than direct drive, a pulley attachment can be readily applied to the blower for particular specifications.

The flexibility of speed and pressure possible with the Standardaire Blower eliminates a great number of blower types normally required in the positive displacement field—a desirable engineering advancement in blower design without disturbing fundamental principles.

For full information and a complete list of blower sizes, write for Standardaire Selection Chart, Publication No. 86.



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**Standard Stoker** 556

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diagrams to show design features. De Laval Steam Turbine Co.

### PIPING, TRAPS

**234 General Catalog on Piping and Valves**—Catalog 49, covering 564 pp, provides full engineering and ordering data on company's line of valves, fittings, pipe and fabricated piping, as well as gages, pressure regulators, steam traps, separators and expansion joints, and also tools and accessories for piping installations. Book is a complete reference text for the selection and installation of piping. It's generously illustrated with photos, sketches and charts, indexed for easy use, and includes full specifications, sizes and prices. Available to qualified plant engineers. Crane Co.

**235 Steam Trap Manual**—"Solving Steam Trap Problems," 36 pp, covers correct trapping practice for unit heaters, jacketed kettles, autoclaves, submerged surfaces, hospital, kitchen and laundry equipment, steam mains, header drips etc. Tells how to select size and determine lift of trap. Explains theory, operation, maintenance; gives details of simplified piping for steam traps. Also discusses float traps, air release valves and pipe line strainers. Specifications, capacities and some prices are given. Book is illustrated throughout and includes condensate and steam tables. The V. D. Anderson Co.

**236 Steam Traps**—Impulse traps for power plant, steam distribution systems, industrial steam processes are described in 16-pp Bulletin T-1739. Illustrated with photos, cutaway and sectional drawings, it tells how to figure sizes needed, gives application data, installation and operating suggestions, capacities, weights, dimensions and prices. Yarnall-Waring Co.

**237 How to Select Steam Traps**—Contending that there is no universal trap, Selection Chart 1600 describes and illustrates thermostatic, inverted bucket, float thermostatic, and liquid expansion types giving advantages and recommendations for use. Includes table showing first and second choice of trap types for 34 applications. Sarco Co., Inc.

### CONSTRUCTION

**238 Roofing Manual**—Full engineering data on manufacturer's roofings and their use is presented in Specifications 50, 36 pp. Covers not only coal tar pitch roofings, but also waterproofings, roof insulations, flashings, protective coatings. Includes illustrated instructions for the roofing of most types of roof construction, including methods of handling special conditions, amount of material required. Tar Products Div., Koppers Co., Inc.

**239 Technical Data on Plexiglas**—This is a file folder of technical and application information on Plexiglas sheets, rods and molding powders, covering their workability, physical properties, available thicknesses. Includes data sheets on the uses and advantages of Plexiglas in large area lighting, typical designs of coffers, photos of installations and a discussion of room lighting. Rohm & Haas Co.

**240 Plexiglas Applications**—This booklet illustrates many of the ways Plexiglas is now being used. Also gives physical properties, sizes and descriptive information about this acrylic plastic in sheet and rod forms and discusses molding powders and their use. Rohm & Haas Co.

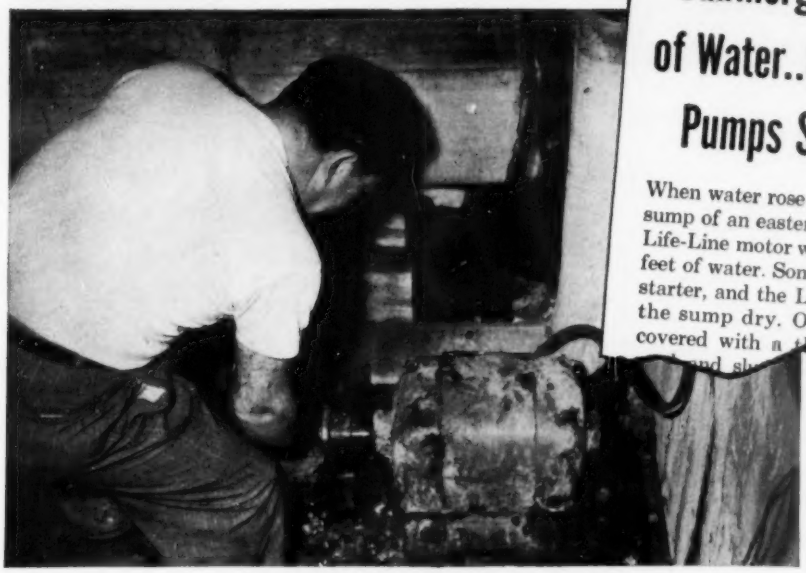
### MAINTENANCE

**241 Manual of System Planning, Preventive Maintenance**—This 50-pp book covers complete story of electrical system planning and maintenance. Covers system functions; code reference chart; voltage drop tables; power factor charts; guides for motor wiring; guides for lighting wiring; electrical system records; supplementary feeder schedule; preparing electrical plans; switchboard and feeder schedule; riser diagram of complete system; motor and control schedule; symbols for wiring plans; preventive maintenance; diagnosing system conditions; general system survey; load survey. Anaconda Wire & Cable Co.

**242 Industrial Products for Maintenance and Construction**—This catalog is a comprehensive collection of data sheets on company's line of industrial products. It gives product descriptions, specifications

YOU CAN BE **SURE**.. IF IT'S

Westinghouse



## Submerged in 6 ft. of Water..Open Motor Pumps Sump Dry

When water rose accidentally in a sump of an eastern plant, an open Life-Line motor was covered by six feet of water. Someone pressed the starter, and the Life-Line pumped the sump dry. Outside of being covered with a thick coating of [illegible]

# Can your *PUMPS* use this Life-Line motor stamina?

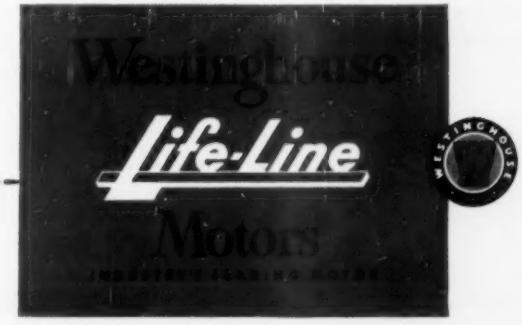
We certainly do not recommend open motors be operated under these conditions—in fact, we say DON'T DO IT! But this actual example illustrates the real stamina built into Life-Line motors—stamina resulting from improved materials and manufacturing methods.

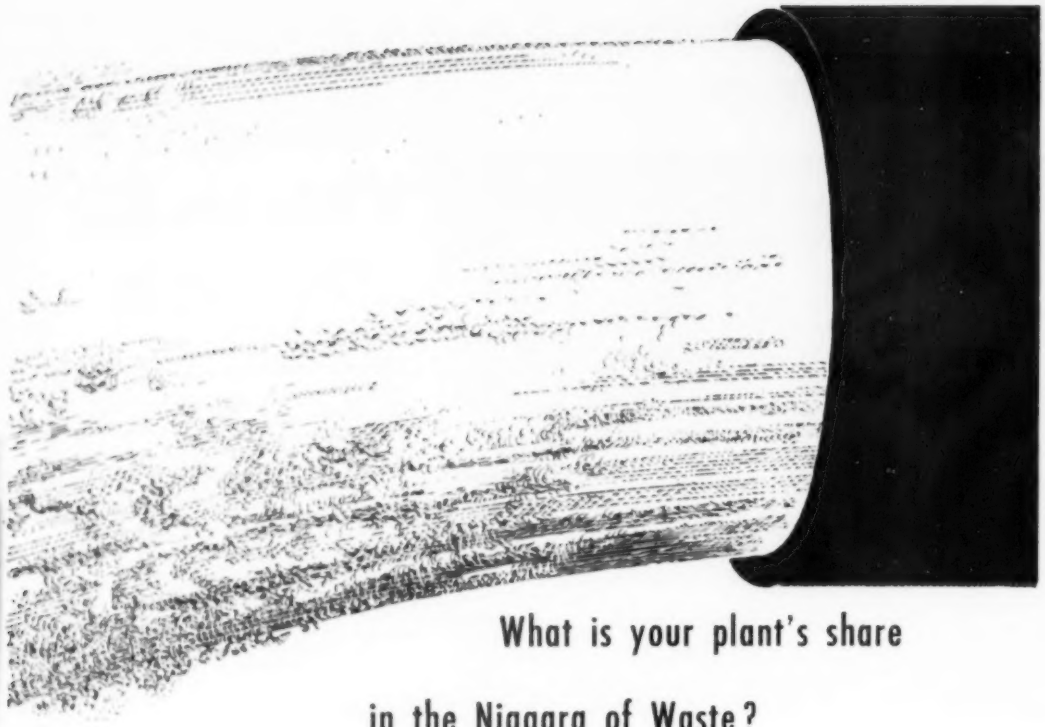
Take the stator, for example. Coils are wound of Tufvar wire—wire you can pound with a sledge, tie into knots, without disturbing the insulation. Pear-shaped slots enable coils to be slipped into place without forcing. A fiber wedge closes top of slot, seals against dirt and moisture. Multiple dips and bakes in Thermoset varnish give the stator a tough flexible film, resistant to oil, moisture, acid and alkali. That's why, in the above example, there was no winding short-out—even under water.

It costs no more to get this extra motor stamina. Simply specify Life-Line as the drive for your equipment. Ask your local Westinghouse representative for details and a copy of booklet B-3842, or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa.

J-21573

*If you figure LIFE-COSTS . . . you'll figure LIFE-LINE*





# What is your plant's share in the Niagara of Waste?

Every working day, industrial plants discharge many times as much water as flows over Niagara Falls.

Since most of this water is returned to streams or to the ground and is available for further use, it isn't "wasted" in the usual sense. To the individual plant, throwing it away, it *is* waste. The plant paid for it, paid to make it fit for plant uses, and must pay again to treat it so that it will not pollute the streams into which it is discharged.

In many plants, too, it is waste in still another sense, for a significant portion of it represents totally unnecessary consumption.

Reduction of such unnecessary water consumption is part of Hall Service. Thus, in one textile plant where Hall was called into consultation on plans for treatment of effluent water, the first step was to study water *use*. It was discovered that water consumption per unit of output had quadrupled over a period of years. Finding the sources of that increase and reducing consumption to normal not only cut the cost of treating the effluent but also effected a substantial saving in expenditures for water.

Over-consumption of water may not be a problem in your plant, but if you are concerned in any way with the industrial use of water, you will be interested in the new Hall bulletin "Let's Consider Your *Whole* Water Problem." May we send you a copy? Hall Laboratories Inc., Hagan Building, Pittsburgh 30, Pa.

## HALL *plant-wide* WATER SERVICE

BOILER WATER CONDITIONING
PROCUREMENT, TREATMENT, USAGE AND DISPOSAL OF INDUSTRIAL WATER

and directions for use. Covers heavy duty mastic floorings, asphalt protective coatings, waterproofing and dampproofing materials, resilient floor covering underlayments, industrial adhesives and cementing compounds, pipe wrappings and coatings, Expansion joint sealers and fillers and other products. The Flintkote Co.

**243 Building Maintenance Manual**—Sixty-four-pp Handbook 7 is packed with useful information on the applications of an extensive line of floor surfacings and other maintenance products, as well as leak stoppers, external wall sealants, road patching, roofing materials. Illustrated throughout with photos and sketches it provides complete product information and step-by-step instructions for use. An extremely valuable reference book, it shows how to analyze problem, select right product, estimate quantity needed and carry out the work. Flexrock Co.

**244 Rolling Scaffolds**—Sectional tubular steel scaffolds for maintenance, painting jobs are described and illustrated in Bulletin PSS-14. Tells how to assemble basic units and how to increase working area. Includes photos of scaffolds in interior, exterior use. The Patent Scaffolding Co., Inc.

**245 Protective Coatings** — Filled with photos of equipment and structures protected by Company's corrosion-preventive coatings, Form 948-A, discusses this coating, tells how surfaces should be prepared for it, suggests ways to apply it and recommends thicknesses. Gives specifications for several solutions and explains value of the coatings in industrial atmospheres, around chemical fumes and moisture and in presence of deteriorating soil conditions, high temperatures. Tar Products Div., Koppers Co., Inc.

## DUST AND FUME CONTROL

**246 Dust Control**—Bulletin 98 explains value of industrial dust control and principles of dust suppression, collection by filtration. Describes and illustrates dust control equipment, providing specifications, dimensions on filters, systems, automatic controls. Lists dusts handled by company's equipment and pictures several installations. The W. W. Sly Mfg. Co.

**247 Dust Collectors**—Operation, construction, versatility and maintenance of company's unit dust collectors are explained in this illustrated bulletin. Includes table of capacities, sizes, also photos of units. The Kirk and Blum Mfg. Co.

**248 Electric Blowers**—Illustrated Bulletin 573 describes portable electric blowers in ⅓ to 1½ hp sizes for removing dust, dirt, grit and grindings from motors, bearings, shafting and gears. Emphasizes economy of blowers in cutting production and repair costs and saving power. Attachments for use with blowers to make them applicable for industrial vacuum cleaning jobs are also presented. Breuer Electric Mfg. Co.

**249 Dust Control**—Bulletin 909A, 28 pp, covers necessity and econdmy of controlling industrial dusts and use of dust control equipment. Describes, illustrates and gives specifications for cloth screen collector. Gives application and engineering data and photos of several installations; also discusses other dust handling equipment. Includes questionnaire outline information needed for analysis of individual plant problems. Pangborn Corp.

**250 Welding Fume Collectors**—Bulletin 37-D describes and illustrates fume collecting equipment for welding operations. Discusses advantages of collecting fumes at the source, hood protection, good working range, easy installation. Illustrates regular, long-reach and special collectors, giving dimensions and application information. Also describes ventilated welding cabinet. Ruemelin Mfg. Co.

**251 Vacuum of Many Jobs**—Bulletin 144, 20 pp describes and illustrates 132 unusual industrial uses for company's vacuum system. Applications, listed alphabetically, range from the removal of dust from inside of rolls of adhesive tape to recovery of zinc dust. The Spencer Turbine Co.

**252 Positive Displacement Blower**—Publication 84 presents an axial flow, high speed blower for handling gas or air under


ATLAS

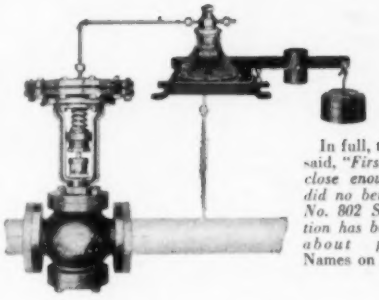
*Super-Sensitive*

PRESSURE REGULATORS

TRADE MARK REG.

*"Then they installed an ATLAS No. 802*

SUPER-SENSITIVE



*and since then operation has been just about perfect."*

In full, this is what the ATLAS representative said, *"First, a diaphragm valve did not regulate close enough. Second, a pilot operated valve did no better. Then they installed an ATLAS No. 802 Super-Sensitive and since then operation has been just about perfect."* Names on request.

*In other words*

THE JOB WAS TOUGH

for other regulators, but it was EASY for an ATLAS Super-Sensitive Pressure Regulator.

The above report is typical of ATLAS Super-Sensitive regulators. They maintain constant controlled pressures within fractions of one pound without perceptible variation under unusual and even difficult conditions, as, for example, where there is a wide fluctuation in demand and considerable variation in initial pressure.

The use of water pressure for the operation of the control valve eliminates any possibility of variations in the initial pressure affecting the controlled pressure, and at the same time provides the regulator with a power that makes it responsive to the slightest variations in the controlled pressure.

*Ask for Bulletin No. 1B*

We cannot give complete data here but you will find it in Bulletin 1-B which gives sizes, prices, typical installations and various designs of this type of ATLAS Regulator.

Briefly, No. 801 is for reduced pressures 2 to 15 lb. No. 801-8 is for reduced pressures 0 to 5 lb. And No. 802 is for reduced pressures 15 to 150 lb. Sizes ½", ¾", 1", 1¼", 1½", 2", 2½", 3", 4", 5", 6".

ATLAS VALVE CO.
291 South St., Newark 5, N. J.
Please send complete information on the ATLAS products as checked at the left.

Name _____
Firm _____
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- ☐ Super-sensitive Pressure Regulators
- ☐ Other Pressure Regulators
- ☐ Damper Regulators
- ☐ Temperature Regulators
- ☐ Reducing Valves
- ☐ Exhaust Control Systems
- ☐ Pump Governors
- ☐ Oil Control Cocks
- ☐ Humidity Controllers
- ☐ CAMPBELL Boiler Feed Water Regulators
- ☐ Thermostats
- ☐ Balanced Valves
- ☐ Control Valves

ATLAS VALVE COMPANY

REGULATING VALVES FOR EVERY SERVICE

291 South St., Newark 5, N. J.

*Represented in Principal Cities*

What Other Drive Gives You...
1. SIMPLICITY, LONG LIFE
So simple that it can be serviced by relatively unskilled mechanics...so rugged that it stands abuse that would wreck other drives...so dependable that it is consistently used where unfailing service is imperative—these are typical advantages gained from the Troy steam engine's basic simplicity. Long life, also, stems from this inherent simplicity and ease of maintenance. Year after year, under the most adverse conditions, Troy Steam Engines continue to deliver dependable, low-cost power.
Plus-
2 ACCURATE, FAST SPEED CONTROL
3 BY-PRODUCT POWER
4 HIGH STARTING TORQUE
5 UTMOST FLEXIBILITY

**Year after year:** Up in the air, out in the open, the Troy Steam Engine continues to drive this kiln in an asphalt paving plant after many years of dependable operation.

## Which Do *You* Need?

If your drive needs any or all of these five characteristics, the *modern* Troy Steam Engine is indicated. Send us your drive requirements and steam conditions, and our engineers will be glad to recommend the right type and size Troy engine to meet your needs.

*Send for Bulletin 306*

TROY

**Troy Engine & Machine Co.**

Power Equipment Division

802 RAILROAD AVENUE • TROY, PENNSYLVANIA


pressure or vacuum from 20 to 15,000 cfm. Photos show complete unit, principal parts. Discusses advantages, lists applications, gives specifications. The Standard Stoker Co., Inc.

## TOOLS

**253 Tool Catalog**—Company's complete line of hand and power tools, tool sets, kits and related equipment is presented in Catalog S, 110 pp. Illustrated with photos of all items listed, it describes tools, includes sizes, applications, shipping weights, other ordering data. Snap-On Tools Corp.

**254 Pipe Bending Tools**—Pocket-size Bulletin E-201, 16 pp, describes hydraulic and hand operated units for bending iron, steel and non-ferrous pipe, rigid conduit, tubing and bus bars. Illustrates each type of tool and tells its applications, sizes. Also describes a power pump for hydraulic units. Stresses economy and efficiency of portable units for making tailored bends on the job. Greenlee Tool Co.

**255 Pipe Tool Ordering Guide**—Catalog 50, 36 pp, covers entire line of pipe tools, machines, power drives, threading oil. Products are illustrated by photo and operational advantages fully explained. Includes concise ordering specifications, current price list. Beaver Pipe Tools, Inc.

## MISCELLANEOUS

**256 Four Handy Guides for Plant Engineers**—Bulletin 20B 6051J, 12 pp, offers data on figuring V-belt drives; Bulletin 51B 6052K, 12 pp, for quick selection of electric motors; Bulletin 52B 6059E, 16 pp, for selection of centrifugal pumps, and Bulletin 25B 6150B, 32 pp, for a description of equipment for power generation, distribution and control. Any or all of these booklets are available—specify those wanted. Allis-Chalmers Mfg. Co.

**257 Industrial Rubber Products**—This is a comprehensive collection of data covering all types of hose, belting, packing and other rubber products manufactured by company, including work gloves and helmets, linings, and hard rubber items. Fully illustrated, provides descriptions, specifications for all products as well as recommended applications. The B. F. Goodrich Co.

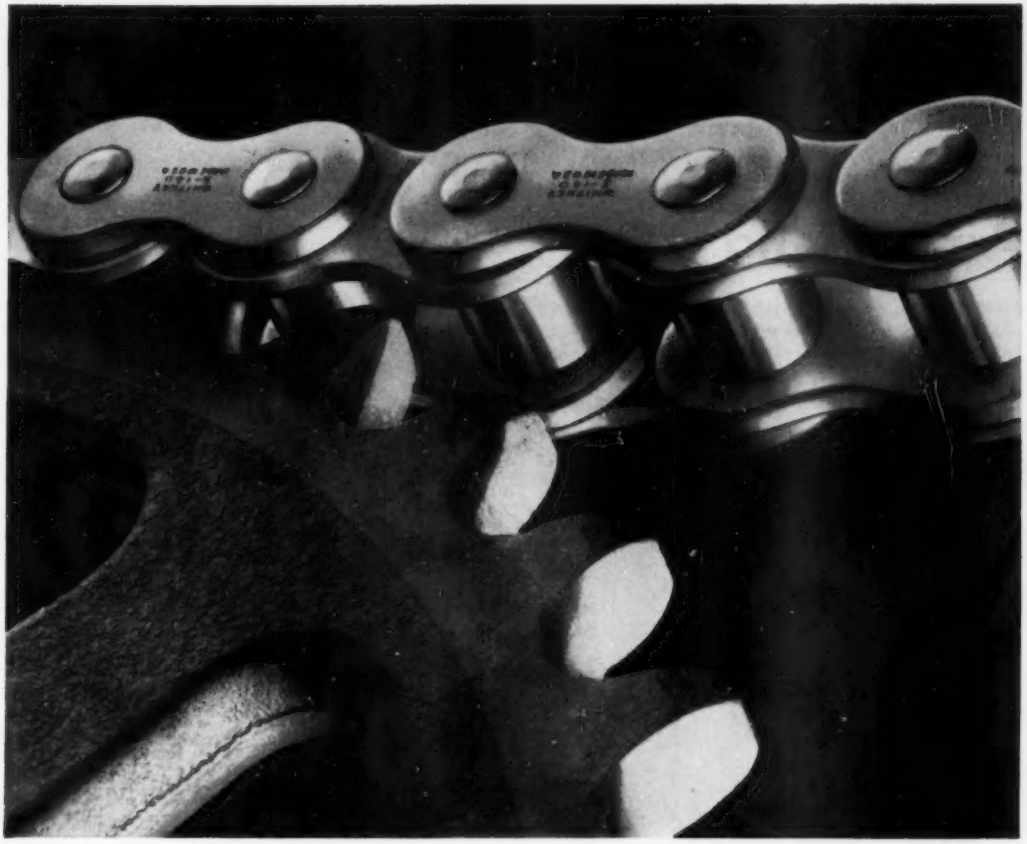
**258 Separators and Detectors**—This illustrated catalog describes permanent non-electric magnetic separators and electronic metal detectors. Specifications on weights, sizes and strength comparisons are given as well as tables of operating capacities for permanent magnetic pulleys, drums, pneumatic line assemblies, pipeline traps, road sweepers and pipe rolls. Eriez Mfg. Co.

**259 Vibration Control**—The advantages and limitations of spring mountings, rubber mountings and cork materials in the control of vibration, together with data on their use are given in Bulletin CI-102. A selector chart tabulates more than 50 applications and recommends types of isolators for both highest efficiency and satisfactory operation under less critical conditions. Loading ranges are given for all types. Also described are isolators for special applications. Korfund Co., Inc.

**260 Steel Work Benches**—Form 701 is an ordering guide for work benches, illustrating models and providing explanation of features as well as listing dimensions and specifications and available top materials. Also gives ordering data on drawer tiers, continuous benches, bench tops, parts and accessories. Standard Pressed Steel Co.

**261 Steam Generators**—A bulletin compiled to present information needed for ordering packaged steam generators, this features a large, 2-color cutaway illustration and explanation of design features. Includes full specifications and dimensions as well as test data. Superior Combustion Industries, Inc.

**262 Self-Lubricating Packings**—Bulletin LP-10 features packings for all industrial requirements. Covers principles of self-lubricating design, structure and performance and discusses individual packings from standpoint of application to specific services. Illustrations and specifications included. Greene, Tweed & Co.



# A Portrait of Drive Efficiency and Savings

**Whitney Chain Drives cut transmission costs, provide positive grip, assure product uniformity**

Here's a close-up view of a Whitney Roller Chain engaging a sprocket tooth. Examine it carefully . . . by looking a little deeper, you can see power transmission efficiency and cost reducing design elements at work. Note the finely finished alloy steel rollers settling down to a positive, yet smooth engagement with the sprocket teeth . . . that's the all-steel combination, supplying the answer to countless drive problems.

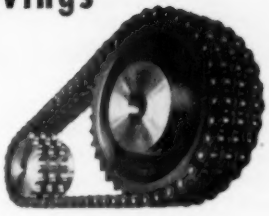
**Here are some of the reasons why:**

**Positive Grip** — Deeply seated in the sprocket teeth, Whitney Roller Chains transmit full rated horsepower without friction or slippage. This means constant machine output is maintained . . . highest transmission efficiency is always obtained.

**Versatility and Adaptability** — Because these roller chains operate on long or short centers, drive shafts clockwise or counterclockwise — separately or simultaneously, they simplify design problems, cut costs of complex drive mechanisms.

**Quality** — The acceptance of "Whitney" as a quality standard by designers of modern machines is the result of decades of chain making. Alloy steel parts are durably made — precisely assembled to stand up under the severest of operating conditions.

Whitney products are readily available through a nation-wide network of Whitney Distributors and Warehouses. Call the one nearest you for prompt service. For engineering assistance and catalogs write:



**OTHER WHITNEY PRODUCTS**

- Silent Chains — for smooth, high speed power transmission
- Conveyor Chains — for modern material handling
- Flexible Couplings — for positive but flexible direct drives
- Cut Tooth Sprockets — for smooth engagement, long life
- Whitney Woodruff Type Keys — for greater strength, easy assembly

**WHITNEY CHAIN & MFG. CO.**

*Division of Whitney-Hanson Industries, Inc.*

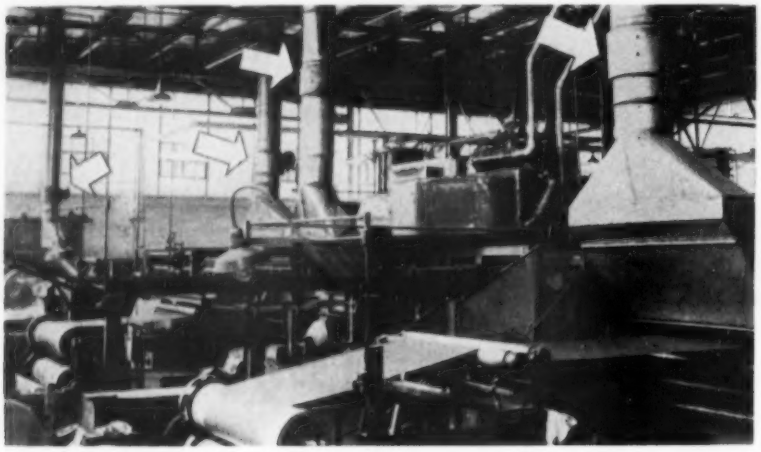
**232 HAMILTON STREET, HARTFORD 2, CONNECTICUT**

# We'll whip your TOUGH Air-moving job

Have you an air-moving job which has never been *really* whipped? Or a new one which looks to be mighty tough? That's the kind we like! Frankly, such jobs are no fun for us . . . but when our equipment and our engineering help prove themselves up to the hilt, as they've done time after time, we've won a friend.

Want to move 50,000 CFM against 4" water gauge pressure? Sure we can do it . . . with a minimum of equipment and "cluttering-up", mighty low power consumption and long, trouble-free service.

Need better ventilation? Want to break up a hot-spot? Are there points of dust or fume concentration? Those are simple things to remedy, but to be *sure,* precisely the correct fan or blower, of the right size and type, should be specified. Don't just buy an oversize piece of equipment — buy the *right* size.



The photograph at the left shows Hartzell equipment installed at the Synthane Corporation, Oaks, Pennsylvania. Previous to the installation of Hartzell Belt-Drive Duct Fans, exhausting through the stacks shown, fumes and heat spread through the plant from the plastic coating machines in the photograph. The plant operator reports that both heat and fumes were completely eliminated by the installation, planned and specified by Hartzell.

When you write to us, or clip and mail the coupon below, you put the whole weight of Hartzell engineering, longest experienced in the propeller-type fan industry, to work on *your* air-moving problems. Application directly to your needs is handled by an experienced, competent Hartzell field office near you. Thus you get not only excellent air-moving equipment but also the widest performance experience available anywhere, applied to your plant by Hartzell men. For the tough or the simple job, do it *best* with Hartzell. Clip and mail the coupon now. There's not the slightest obligation.

**CLIP** — and mail now

I have an air-moving job which I consider tough, and I want it done right. Get the details from me and let me have your recommendations. This puts me under no obligation whatever.

Name_____

Company_____

Street and No._____

City and State_____

**HARTZELL**
**PROPELLER FAN CO.**
DIV. OF CASTLE HILLS CORP.
**PIQUA, DEPT. C OHIO**

PROPELLER-TYPE FANS AND BLOWERS—ROOF VENTILATORS—UNIT HEATERS • ENGINEERING OFFICES IN PRINCIPAL CITIES

# *New Products and Methods*

## 1—ANTI-STATIC DEVICE

**To protect personnel against static electricity explosions**

The Nostat is intended to supplement protection of conductive floors in chemical and munitions plants, ordnance depots, paint factories, hospitals, textile mills and wherever static sparks create an explosion hazard. It is designed to assure a positive electric contact between body and floor so

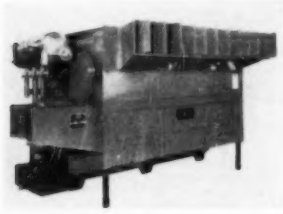
static charges are drained off. A garter which makes contact with the skin, is connected by a flexible bead-chain to a floor contact pin that clips on the sole of the shoe, and maintains electric contact with the conductive floor, company explains.

The Nostat is described as light and easily put on. Flexible leg garters are available, adjustable to any size. Linking bead-chain has telescoping expansion unit. Walter G. Legge Co., Inc.

## 2—SPRAY FAN COOLER

**For low-ceilinged rooms requiring high capacity refrigeration**

In the "low head room" design of this cooler the fan section is on the side of the unit. Air enters the spray section at the top; is chilled in passing down through the spray and over refrigerant coils; enters the fan section at bottom and is discharged from the side at the top. When refrigerant temperatures below freezing are used, the process is kept free from frost, ice, or from freezing by the use of brine or company's No Frost in the sprays.



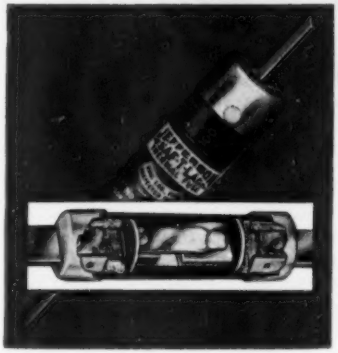
The application is to food freezing and storage, meat packing, ice cream hardening, candy chilling, cooling, and freezing tunnels. Five unit sizes are produced with capacities from 1680 to 11,000 cfm of chilled air. Maximum height is 72 in. Floor space required ranges from 18 to 72 sq ft. Niagara Blower Co.

## 3—CLOTH BAG DUST FILTER

**Features reverse air blasts to prevent dust settling on bags**

Among advantages claimed for the Dynaclone is the elimination of loss of efficiency


CUT Idle Time COSTS



JEFFERSON SAF-T-LAG *Thermal* FUSE

JEFFERSON ELECTRIC

Plant costs go on whether machinery is idle or operating. Needless motor stops and expenses can be avoided by using fuses which protect TIME as well as motors.

In Jefferson Saf-T-Lag Thermal Fuses a leaf type trigger spring is rigidly connected to one of the two solid copper elements while the other end, under tension in an upward direction, is held to the opposite copper element by means of solder having a melting point of 280° F.

Since the heat is absorbed until reaching the melting point of the thermal solder connection, which involves a longer heating interval, the result is a time-lag four to five times longer than usual.

On heavy overloads and on short circuits, the notched thin end fuse elements provide immediate protection by blowing in less than 1/10 of a second—before the thermal solder can melt.

**JEFFERSON ELECTRIC COMPANY**

**BELLWOOD, ILLINOIS**

# 77% SAVED WITH Ramset

FASTENING SYSTEM

SEVEN TIMES FASTER than with his old method, this contractor set 240 RAMSET FASTENERS through 2" x 2" x ¼" steel angles into concrete with RAMSET—at a saving of $463.00! You can save comparable sums with RAMSET when fastening into steel, concrete, masonry or other hard materials. For proof, ask us for a free Cost Comparison Sheet and put down your actual cost figures. You will see quickly the substantial savings you can make with the light, portable, proven RAMSET TOOL.

RAMSET eliminates slow, costly, tedious drilling, chipping, tapping and plugging. Actual fastening time with RAMSET—less than one minute per fastener with any of the 65 types and sizes of plated RAMSET FASTENERS.

In 20 seconds, RAMSET can be loaded, ready for use. Place the Tool against the work—and RAM! The fastener is SET!—tight and right. RAMSET requires no complicated methods or separate small parts that can be lost or forgotten. RAMSET TOOLS may be cleaned and reassembled in less than five minutes, to keep them at top operating performance.

A 15 minute demonstration will show you how much time, money and trouble RAMSET can save. Call your local RAMSET representative today or ask us for details and free Cost Comparison Sheet.

**Ramset System**

**SAVES TIME . . . CUTS COST ON JOBS LIKE THESE:**

*Fastening —*

- Framework, brackets or supports to steel or concrete.
- Electrical equipment and services.
- Metal or composition roofs or walls.
- False and acoustical ceilings.
- Wire mesh for gunite.
- Heating, piping and air conditioning.

**STEMCO CORPORATION**

12117 BEREA RD. • CLEVELAND 11, OHIO

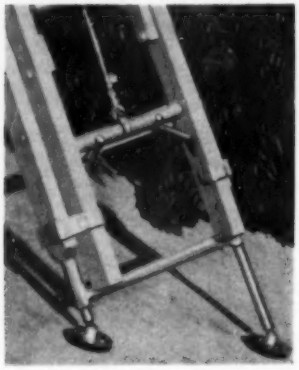

ciency due to the building up of a dust layer on the cloth bags. This is said to be prevented by frequent blasts of reverse air which are created by main fan of dust control system and require no auxiliary equipment. Operation is described as continuous and automatic, the suction at dust source as uniform. The W. W. Sly Mfg. Co.

## 4—LADDER ATTACHMENT

**For automatically correcting unlevel ground conditions**

Designed to provide greater safety for ladder users, the Hydra-lizer has interconnected hydraulic units for displacing oil from one into the other, as ladder is erected, to correct differences in terrain from hillsides to stairways. By moving a foot operated valve lever, the ladder can be instantly locked in any position desired, it is stated.

The unit is said to be easily attached to all types of ladders, wood or metal,



straight or flared base. Telescopic steel tubing automatically adjusts to proper width and unit can be reused on ladders of different dimensions, company points out.

The ball and socket shoe provided to conform with irregularities of terrain can be instantly flipped up on end for ice, slippery or soft ground conditions, company reports. Made of steel for working loads of over 500 lb, weighs 6 lb. Anderson Products Co.

## 5—VINYL RESIN COATING

**For wet or dry service; operating temperatures of -40 to 160F**

This coating is described as resistant to alkalies and mineral acids; as insoluble in alcohols, greases, oils, and aliphatic hydrocarbons, and as having low permeability to water vapor and low water absorption. It is recommended for applications where metal is subject to deterioration from chemical or moisture attack. An applied film of this material is non-flammable and imparts neither taste, odor or toxity, company states.

It is also claimed to develop good adhesion to relatively smooth surfaces without heat curing, and to dry rapidly to a tough, durable surface. Comes in black or gray high gloss finish. Other colors may be formulated. For application by brush or spray at coverage of 400 sq ft per gal. The Dampney Co. of America.

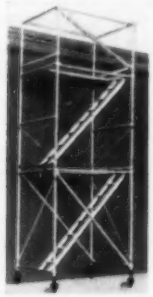
## 6—ROLLING SCAFFOLD

**Of aluminum, is sectional type for overhead, sidewall work**

Described as light, easily erected and neat looking, this scaffold is offered in stairway and ladder types. All parts, except casters, are light, durable aluminum alloy, company reports. Scaffolds are supplied in one or more sections, with guard rails. Bottom section, including non-elevating casters, is 7 ft 3 in. from ground to first platform.

Do you want more information on this equipment and its application? Use the no obligation, no postage card between 29-30 and 79-80.

Each additional section is 6 ft 8 in. high. Base is 4 ft 6 in. by 6 ft. Five-in. steel casters are available in both non-elevating and adjustable types.



Frames for intermediate sections slip over a sprocket in lower section. This joint is secured by a hinged pin for greater safety. The Patent Scaffolding Co., Inc.

## 7—VERSATILE HAMMERS

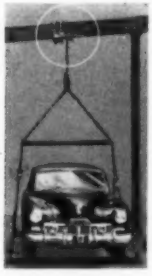
**Have replaceable faces suited to different types of work**

These handy tools are equipped for rapid replacement and interchange of faces—available in rawhide, Basa molded composition, plastic, copper and babbitt—to offer selection of face that suits work and prevent marring or piling up of material struck.

Hammers are designed to insure firm grip on face, despite variations in circumference of faces. Lacquered hickory handles are shaped to fit the hand, have grip portion enameled. Metal parts are finished with baked-on aluminum coating said to be rust resistant, hard wearing. Greene, Tweed & Co.

## 8—PIPE WRENCHES

**Are designed for maximum strength with minimum weight**



Through stress analysis in design useless metal was engineered out of the Roxco Pipe Wrenches, manufacturer explains, and extra metal, where needed, was engineered in. Testing methods included hanging a 4510-lb automobile from the handle of one of these wrenches, as illustrated.

Other features include induction-hardened teeth, comfort-shaped handle, and cushion-action. In sizes from 8 to 48 in., each carries individual serial-numbered guarantee against breakage, according to company. Trimont Mfg. Co.

## 9—COMPARATOR CHART

**For choosing welding electrodes, is pocket-size, slide rule type**

This handy chart lists all of company's welding rods and electrodes and indicates type of service for which each is designed. Other manufacturers' electrodes designated as close equivalents for applications noted are also listed. Listings are keyed to AWS classification numbers and comparison data may be read directly off the slide rule. AWS class designations are explained on back of comparator slide rule. General Electric Co.

## 10—VIBRATING CONVEYOR

**Features mechanical vibration, low electric power requirement**

The MV Conveyor is described as operating on a system of balanced forces. It consists of a conveyor deck (pan or tube) mounted on cantilever spring bars, two beam supports, a counterweight, similarly mounted, and the drive. Weight of deck and counter-

*(Continued on page 82)*

*WeldOlets, Butt Welding* — Available as standard, with outlet sizes from ⅛" to 24", both straight and reducing for use with Schedule 40 pipe up to 12" outlet. Outlet sizes 12" - 24" for standard weight pipe (⅜" wall). Also available for Schedule 80 services through 8" outlet and extra strong through 24" outlet size (for use with pipe having ½" wall).

**You write**

**SPEED, ECONOMY AND FULL PIPE STRENGTH**

***into the job when you specify* WELDOLETS**

With WeldOlet branch pipe welding fittings you provide the quickest, most economical, most satisfactory method of obtaining full pipe strength at branch connections.

Note in the above illustration how the WeldOlet tapers to provide a single bevel groove joint at the crotch section and blends into a V-butt joint at the ear portion.

WeldOlets need no additional reinforcement to establish and fully maintain original strength on ASTM A-106 Seamless Steel Grade A Pipe, as set forth in Code for Pressure Piping, American Standards Association, B31.1-1942, and Supp. No. 2, B31.1-b-1947.

To meet special conditions, these fittings can be furnished in any forgeable metal including wrought iron, toncan iron, nickel, Monel, Everdur, stainless grades 304, 316, 347, etc.

For detailed engineering reference data, write for Catalog W-2.

**BONNEY FORGE & TOOL WORKS**

*Forged Fittings Division,* 350 Green Street, Allentown, Pa.

*Authorized Canadian Factory Representative:*

STERLING STEEL COMPANY, LTD.
267 Davenport Road, Toronto, Canada

# WELDOLETS

**FOR WELDED BRANCH PIPE OUTLETS**

*WeldOlets, Socket Welding* —Available as standard, with outlet sizes ⅛" - 10", both straight and reducing, for use with Schedule 40 pipe. Also available in Schedules 80 and 160 up through 4" outlet size.

*ThredOlets* — Available as standard, with outlet sizes ⅛" - 10", both straight and reducing, for use with Schedule 40 pipe. Also available in Schedule 80 up through 2" outlet size.

Fig. 1—Cut-away view of reducing size WeldOlet with welding outlet in place. The external rib and wide bases or footings of WeldOlets eliminate the need for extra supports to take care of bending or vibrational stresses at crotch section, the point of greatest stress.

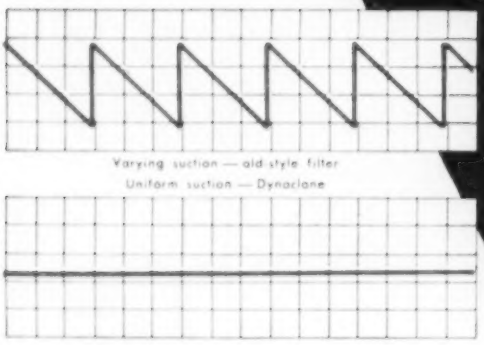
Fig. 2—Note blending of ear portion of welding fitting to run pipe. Extension of weld metal below inside scarfed portion of pipe insures all sections of joint greater than pipe wall thickness.

NEW! NEW!

# NEW Cloth Screen Dust Filter

# SLY DYNACLONE

## offers 5 NEW ADVANTAGES!




1. Eliminates mechanical shaking.
2. Provides uniform suction at dust source.
3. Assures longer bag life . . . 4. minimum maintenance.
5. Keeps itself automatically and continuously clean without additional power or equipment.

Send for descriptive bulletin just out on the new Sly Dynaclone — the ultimate in filter performance.

*Patent Applied for

This revolutionary new dust filter is another Sly first. Extremely simple and thoroughly dependable, it eliminates entirely the gremlin of mechanical shaking and provides uniform suction of air at dust source.

This uniform suction is achieved by a simple device which cleans the filter bags successively by a reverse flow of air—the same suction which draws the dust onto the filter cloth is reversed to blow it off.

Since this reverse air suction operates continually, the new Sly Filter requires no shutdowns for removing dust from the cloth.

No mechanical shaking or flexing device is needed, eliminating all strain and wear on the filter bags.

The simplicity of design and operation and elimination of all auxiliary equipment for periodic cleaning of bags mean a saving of floor space and a very minimum of maintenance.

The result of long experimentation and exhaustive tests, the Sly Dynaclone has thoroughly proved itself. It provides substantial savings over any other type of cloth screen dust collection. Write for complete information.

**SLY** PIONEERS and LEADERS in INDUSTRIAL DUST CONTROL

**THE W. W. SLY MANUFACTURING CO.**
4753 Train Avenue • Cleveland 2, Ohio
NEW YORK • CHICAGO • ST. LOUIS • PHILADELPHIA
DETROIT • MINNEAPOLIS • BIRMINGHAM • CINCINNATI
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# Bulletins on Current Plant Problems

(Continued from page 30)

## TOOLS

**144 Fastening Tool**—A powder-actuated fastening tool described as affording controlled, high penetrating power and increased safety, as well as reduced operating costs and quieter operation is introduced in this illustrated folder. Explains how tool works and stresses its advantages in fastening steel or wood to concrete or steel. Also illustrates and provides sizes of drive-pins available. Powder Power Tool Corp.

**145 Wagon Drills**—Bulletin H-1209-B36A describes three models of wagon drills with cylinder bores of 4, 3½ and 3 in. size, providing specifications for both drifter and wagon mounting and featuring large sectional illustrations to show design. Includes photos of drills set up for various jobs, as well as pictures of drills at work. Worthington Pump and Machinery Corp.

**146 Portable Power Tools**—Form 13-1 is a pocket-size, fully illustrated catalog covering electric and gasoline hammers, vibrating floats, vibrators, and electric drills, screw drivers, grinders, sanders and polishers. Describes tools and tells their uses, gives sizes, power requirements. Syntron Co.

## WELDING, SOLDERING EQUIPMENT

**147 Welding Electrodes**—Catalog RW-140 contains description data, welding procedure, mechanical properties and specifications on company's line of electrodes. Covers approximately 30 types of electrodes in steels, cast iron, bronze and alloys. Hobart Brothers Co.

**148 Aluminum Bronze Electrodes**—"Cutting Maintenance Costs with Aluminum Bronze Electrodes," is the subject of an article by Joseph A. Cunningham. It describes the successful salvage and repair of worn or broken parts. Such parts as pump shafts, gears, clutch pinions, cable idlers, overhead crane track are mentioned. Illustrated with photos of repair jobs. Ampco Metal, Inc.

**149 Solder Pre-Forms**—"How to Speed Up Soldered Assemblies with Solder Pre-Forms" is the title of this bulletin. Tells the what, how, and when on the uses of pre-formed solder shapes and includes illustrated chart showing their wide range of applications. Soldering Specialties.

## CLEANERS, PIPING, ACCESSORIES

**150 Air and Gas Cleaners**—Manual 130-E covers new designs and improvements in oil bath air and gas cleaners. Recently added sizes and a new design are introduced. Photos of models, charts, dimension table and detailed engineering data are included. American Air Filter Co., Inc.

**151 Valves, Lubricators and Piping Accessories**—Here's a condensed catalog covering, briefly, several types of valves, hose assemblies and connections, filters, regulators and lubricating units. Illustrates equipment, tells applications, sizes. C. A. Norgren Co.

**152 Rubber-Lined Piping**—Catalog Section 9780 on rubber-lined pipe, fittings and valves gives design and construction features and service recommendations, lists uses, and describes and pictures the products. Includes specifications, dimensional data. The B. F. Goodrich Co.

**153 Flexible Plastic Tubing**—Bulletin T-77, 24 pp, provides complete technical data on six standard formulations of company's flexible plastic tubing including comparative properties, chemical resistance characteristics, laboratory and industrial applications. Standard sizes of tubing are listed. Photos show examples of tubing in use. U. S. Stoneware Co.

**154 Sheet Packing Data**—Various types of sheet packing manufactured for handling liquids, gases and abrasives are presented in Bulletin 5000. It lists specifications and outlines uses of the different kinds of packing and describes materials used in their construction. The B. F. Goodrich Co.

**155 Pipe Sizing Tables for Steam and Water**—This folder provides, in tabular form, three multipliers by use of which you can quickly and accurately find pipe size for flow of steam and water at any pressure and temperature and any allowable pressure drop, all developed by A. B. Stickney, and previously published in *Power Generation*. Takes account of resistance of valves and fittings to flow of fluids. Complete instructions for use of the multipliers with example. Everything you need for quick, accurate pipe sizing on two pages for your notebook or file. The Rust Engineering Co.

## PROTECTIVE COATINGS

**156 Protective Coatings for Industry**—Bulletin 7-1 is filled with information on coatings suitable for protection against corrosive fumes or splash on steel, concrete, and wood surfaces. Includes information on surface preparation, container sizes, coverage. The Atlas Mineral Products Co.

**157 Asphalt Coatings**—Data Sheets 1-C 221, 222 and 229 describe three asphalt coatings for industrial use. These include a solvent type asphalt coating containing asbestos and mineral stabilizers for water resistance on the interior of exterior masonry walls; a similar material for brush applications, and a heavy consistency asphalt cement for repairing roofs, leaks and cracks in masonry for maximum resistance to water and weather. Recommended uses and directions for application are included in the information. The Flintkote Co.

**158 Vinyl Finishes and Coatings**—Many of the industrial maintenance applications of these products are described and pictured in this folder. Also explains major advantages of the vinyl finishes and discusses briefly several of company's other products. Gates Engineering Co.

## PUMPS

**159 Pumps for Latex**—Bulletin 4000-L illustrates and describes a centrifugal pump designed for handling creamed or centrifuged Latex but adaptable for other liquids. Explains construction details, gives capacities. The Deming Co.

**160 Flow Pumps**—Data Sheet 84 gives illustrated information on a new 5-in. stroke, 2-cylinder, direct-flow pump. Information presented includes construction and design details, general specifications, dimensional drawings, selection chart and table and drive specifications. The Aldrich Pump Co.

## SPEED REDUCTION

**161 Data Book on Speed Reducers**—Bulletin G-WB, 28-pp, contains a complete description of company's horizontal worm gear speed reducers. Shows available types and gives standard specifications. Also contains complete horsepower rating tables, overhung load ratings, dimension tables and information on how to select worm gears. Photos of various models and dimensional drawings are included. De Laval Steam Turbine Co.

**162 Herringbone Speed Reducers**—Illustrated Catalog 40-B is a 44-pp comprehensive ordering book on parallel-shaft, continuous-tooth herringbone speed reducers of both the single-gear offset drive and double-gear straight-line drive types. Discusses design advantages of company's speed reducers, gives general specifications, explanation of rating tables, ordering tips and selection data. Full dimensions and ratings are provided and current price list folder is included. D. O. James Mfg. Co.

**163 Vertical Speed Reducers**—Two new models of vertical worm gear speed reducing units are introduced in illustrated Bulletin 125. Sectional photos showing design principles accompany text. Data covering capacities and dimensions are included. Also pictured and described are two smaller sizes of vertical units available from company. The Cleveland Worm and Gear Co.

## DIESELS AND ACCESSORIES

**164 Diesels, Their Fuels and Lubricants**—This 46-pp book offers a well organized and attractive presentation of practical information on diesel engines, covering their history and economics as well as discussing their design characteristics and operating principles. Classification of diesels according to speed is explained. Other chapters cover injection systems, combustion chambers, lubricating systems, and diesel oil purification and filtration. The balance of the book is devoted to a discussion of fuel and lubricating oil required by diesels and description of company's products. Book is filled with photos, sectional illustrations and schematic drawings and includes table showing relation of engine performance characteristics to fuel properties. Sinclair Refining Co.

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March, 1950

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**165 Diesel Engine Torque Converter Unit**—Fully illustrated in color, 24 pp Catalog & SA-18 discusses company's new diesel engine torque converter unit—how it works and what it can do. Besides giving the inside story of this combination torque converter and fluid coupling, catalog explains its special features and describes and pictures its application to tractors, cranes, excavators and special equipment for the petroleum and other industries. Includes performance charts of several vehicle engines. Industrial power units. Detroit Diesel Engine Div., General Motors Corp.

## METALS

**166 Rust Resistant Steels**—Steels with improved chemical and acid corrosion resistance are the subject of this folder. Includes information on their tensile strength, weldability, structure and electrical conductivity. Also contains photos showing effects of etching with aqua regia and picric acid on these and other metals. Unworld Research Corp. of America.

**167 Bronze Bars**—This bulletin announces manufacturer's expanded line of cored and solid "Tiger" bronze bars in popular sizes, both rough and machined. Lists sizes and weights of the bars, shows physical properties of the material, describing its uses and its advantages of wear and shock resistance and anti-frictional qualities. National Bearing Div., American Brake Shoe Co.

## SCAFFOLDING, LADDERS

**168 Scaffolding Equipment**—How company's tubular steel scaffolding and related equipment is adaptable to many industrial maintenance and construction jobs is stressed in this illustrated bulletin. Also discusses their safety features, ease of erection and dismantling, and light weight. Describes and illustrates in detail company's quickly-assembled units, maintenance trestles, low base units, towers, and accessories, including dimensional data and specifications. Bil-Jax, Inc.

**169 Ladder with Elevating Platform**—This illustrated bulletin provides specifications and dimensions for a ladder with an elevating platform on which user stands while working. Explains how platform is attached to ladder, how it can be used with scaffold, staging, trestle platform. Covers full ladder assembly, parts, accessories. Includes price list. Colvin Bros. Mfg. Co.

## MISCELLANEOUS

**170 Payroll Tabulation**—Bulletin TM 800 presents five sample payroll tabulations demonstrating ability of company's tabulating machines to produce payrolls, earnings records, other reports required in payroll procedure. Remington Rand, Inc.

**171 How To Start A PM System**—As pointed out by this manufacturer of systems and records, many companies would like to start a preventive maintenance system but don't know just how to go about it. In this 24-pp book they have "case studied" the PM program at Link-Belt Co. and, in step-by-step manner, present the "how" and "why" of the entire operation. All forms and records are illustrated and the detailed procedure explained. Acme Visible Records, Inc.

**172 Manual on Power Transmission Machinery**—Containing 225 pp of helpful data on mechanical power transmission equipment, this illustrated handbook is recommended for the plant engineer's permanent reference library. Covers roller bearings, V-belt drives, friction clutches, couplings, and collars, sleeve bearings, pulleys, take-ups and hangers. Provides full engineering data and selection and ordering information on equipment, includes useful formulas, photos of installations. Indexed. Dodge Mfg. Corp.

**173 Suspended Ceiling Pointers**—Company's method of suspended ceiling construction, together with recent developments useful in installing ceilings with or without acoustical materials, are described and illustrated by photos and drawings in the 1950 edition of Catalog N-2. Shows how installations for acoustical ceilings are made in only three operations. Includes specifications and listing of distributors. The Sanymetal Products Co., Inc.

**174 Rotary Feed Tables**—Bulletin T-25 gives detailed information on how both mechanically operated and electrically operated rotary feed tables can be used for faster feeding of work pieces to machine tools to lower production costs. Illustrated with many photos of models in use as well as photos and drawings showing methods of synchronization, and dimensional sketches. Includes specifications and tips on locating fixtures and installation. The Bellows Co.

**175 Fastenings in Stock**—Here is a 30-pp listing of some 7000 fastening items carried in stock by manufacturer—bolts, nuts, screws, rivets, pins. Indexed and arranged for easy reference it gives sizes, available metals and includes suggestions on how to order. The H. M. Harper Co.

**176 Selective Hardening**—This 6-pp folder gives detailed examples with photos of the application and use of a pack-hardening paste and isolating paste. Includes price schedule. Dennis Chemical Laboratories, Inc.

**177 Spreader Stokers**—Specifications, dimensional data and information on the operation of a pneumatic spreader stoker are provided in Form 1617-A. Illustrated with photos and cutaway drawings, it discusses complete firing system including coal metering, coal dryer and preheater, conveying, distribution of coal, grates and cinder return. Describes standard equipment in assembly and includes dimensional drawing of undergrate fan units. Iron Fireman Mfg. Co.

**178 Coal Dust Control**—"For 1¢ a ton—complete freedom from coal dust, and for another 1¢, dustless ashes." is the story told in this illustrated bulletin describing a system of dust control in coal and ash handling. Tells advantages and applications of system, explains equipment and "wet water" solution used. Aquadyne Corp.

**179 Water Heaters**—Bulletin BZ-849, 24 pp, offers full data on two-pass and four-pass instantaneous water heaters for heating water with steam to provide low cost hot water for process work and wash rooms. Includes general information, selection tips, tells how to determine amount of steam required and illustrates a typical installation. Also discusses construction features and includes dimensions. Bell & Gossett Co.

**180 Hydrogen Zeolites in Water Softening**—Described as one of the few reports published on the results obtained from organic zeolites in the hydrogen cycle with acid regeneration is Article TA-115, written by V. J. Calise. In addition to presenting operating data from several commercial hydrogen zeolite installations, the paper also explains applications of acid-regenerated zeolites, compares sulfonated coal type and resin type zeolites and discusses factors involved in establishing conclusions on effectiveness of this method of water softening, including silica removal. Includes tables of results obtained and charts showing characteristics of these zeolites. Graver Water Conditioning Co.

**181 Window and Door Handbook**—This 36-pp recently-published manual presents complete engineering data on company's steel windows and doors. Clearly illustrated with photos and drawings, the book provides construction details, specifications and installation tips on available types of windows, including continuous windows and operators, also industrial doors, special finishes available. The William Bayley Co.

**182 Insulated Roofs**—This 36-pp manual presents facts derived from recent research and applied to the solution of long-existing roof problems. Illustrated with photos and drawings, it covers the control of heat flow through roofs, location of insulation, standard installation methods. Describes and illustrates company's roofing insulations and their special applications. Photos show detail of insulating materials, how and where they're used to advantage. Owens-Corning Fiberglas Corp.

**183 Cavitation in Hydraulic Turbines**—"Prevention and Reduction of Cavitation and Pitting in Hydraulic Turbines" is the subject of Bulletin 02B7226. Applicable basic formulas are elaborated upon and relative merits of avoiding cavitation or minimizing its effects are presented. Several examples of pitting, the destructive effect of cavitation are shown, and pitting is differentiated from erosion and corrosion. Mechanisms of cavitation and pitting are explained. Resistance of various special metals to pitting is given and methods of utilizing these metals at critical points are discussed. Allis-Chalmers Mfg. Co.

**184 Toilet Compartments**—Catalog 87 shows five types of toilet compartments and toilet room environments in colors, including, overhead braced, ceiling hung, floor supported, and standard flush and panel types. Contains construction details, specifications, hardware, and description of materials used. Other products cataloged are hospital cubicles, shower cabinets and stalls and dressing room compartments. Includes color chart with 21 color chips. The Sanymetal Products Co., Inc.

**185 Scale Formation**—Here is a technical article on the mechanics of scale formation, corrosion and other attacks on boiler metals and the role played by company's de-scaler unit in correcting and eliminating them. Describes de-scaling unit, explains its operation and discusses its use. Butler Engineering Co.

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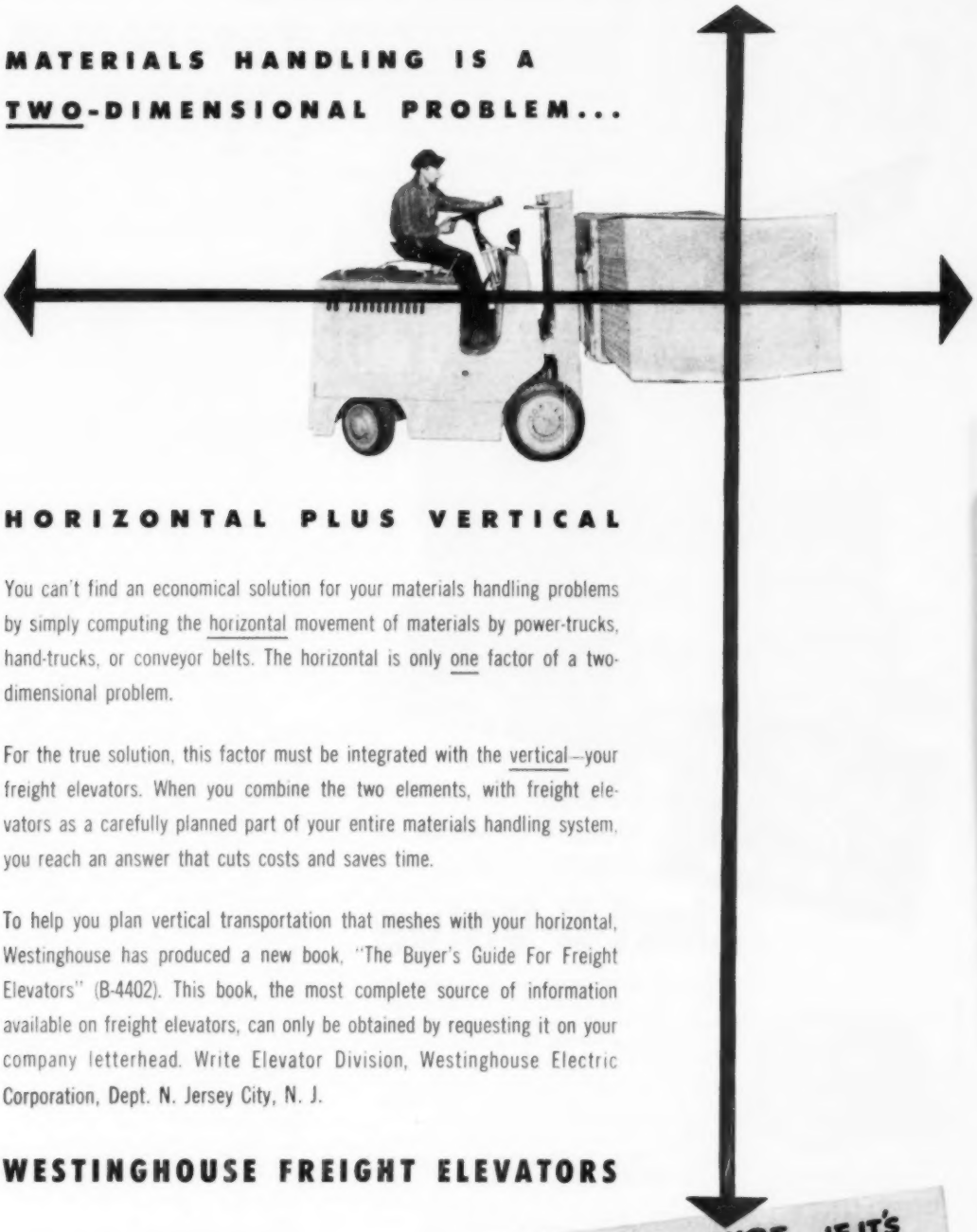
**MATERIALS HANDLING IS A TWO-DIMENSIONAL PROBLEM...**



**HORIZONTAL PLUS VERTICAL**

You can't find an economical solution for your materials handling problems by simply computing the horizontal movement of materials by power-trucks, hand-trucks, or conveyor belts. The horizontal is only one factor of a two-dimensional problem.

For the true solution, this factor must be integrated with the vertical—your freight elevators. When you combine the two elements, with freight elevators as a carefully planned part of your entire materials handling system, you reach an answer that cuts costs and saves time.

To help you plan vertical transportation that meshes with your horizontal, Westinghouse has produced a new book, "The Buyer's Guide For Freight Elevators" (B-4402). This book, the most complete source of information available on freight elevators, can only be obtained by requesting it on your company letterhead. Write Elevator Division, Westinghouse Electric Corporation, Dept. N, Jersey City, N. J.

**WESTINGHOUSE FREIGHT ELEVATORS**

**YOU CAN BE SURE...IF IT'S Westinghouse**

(Continued from page 77)

weight are balanced. The number and thickness of spring bars are so related to these weights that natural frequency of machine is close to speed of eccentric drive. Since built-up restoring force of cantilever bars is basic drive force, the motor simply maintains balanced forces.

The machine drive unit consists of motor, V-belt drive and floating eccentric shaft. Each drive unit operates two equal length conveyor sections; up to 80 ft of conveyor can be operated from one drive unit. This conveyor is said to have vibration isolated within machine itself, and to provide conveyability at controlled depths horizontally, downhill, or uphill as steep as 10 deg. It is intended to handle abrasive, lumpy or rough materials, hot or cold, dry or wet, also materials. The Jeffrey Mfg. Co.

## 11—BELT DRESSING

**Is rubber-like synthetic for cleaning, preserving surfaces**

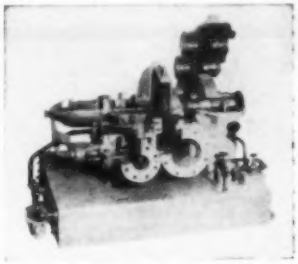
Belt-Fluid is claimed to increase a belt's pulling power by 50 per cent. It is intended to preserve leather, canvas or rubber belts, and to impregnate, waterproof, and lubricate fibres of leather or fabric belting. This liquid is also said to counteract slipping action due to absorbed lubricating oils and not collect dust or lint.

According to manufacturer regular use of Belt-Fluid gradually cleans off any caked-on old belt dressing. It is colorless and described as fireproof, easily applied and economical. Chesterton Mechanical Packings.

## 12—STEAM TURBINES

**With close-coupled, integral reduction gears for low speed uses**

Fans, pumps, compressors and generators can be driven at proper speed by these Gearturbines while turbines operate at their most efficient speed, according to manufacturer. The units combine a rugged, compact speed reduction mechanism coupled to company's Type E turbine and designed to operate as a single unit. They are available with standard gear reduction ratios.



Three machined feet support the unit. Single helical gears with low helix angle give low thrust against bearings. Endwise movement of one shaft does not affect axial location of other, it is stated, and thrust is not transferred from gears to turbine. The Gearturbine is shipped as completely assembled unit. Turbine and gear are on a heavy plate steel base which also serves as oil tank. Westinghouse Electric Corp.

## 13—DEAERATING HEATER

**For lowering the oxygen content of boiler feedwater**

This heater is designed to reduce oxygen in feedwater to less than 0.005 ml per liter (ASTM Referee or modified Winkler) regardless of rapid load variations or unusual operating conditions. $CO_2$ is also removed, company states, to protect boilers and accessories from corrosion and pitting.

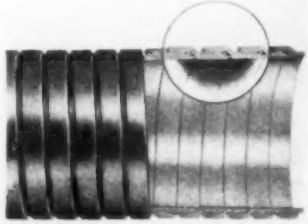
In this heater, spring-loaded, self-adjusting spray valves in the first stage cause heating of incoming water to within 2 to 4 deg of the steam so as to remove most oxygen and free $CO_2$. In the second stage, the preheated water is mixed with a large excess of incoming steam by scrubbing baffles, so most of the steam which remains as vapor carries with it small traces of undissolved gases on the way to the first stage where it heats incoming water. Heaters come in sizes up to 2,000,000 lb per hour, and the second stage of each heater is made to fit individual plant conditions. Graver Water Conditioning Co.

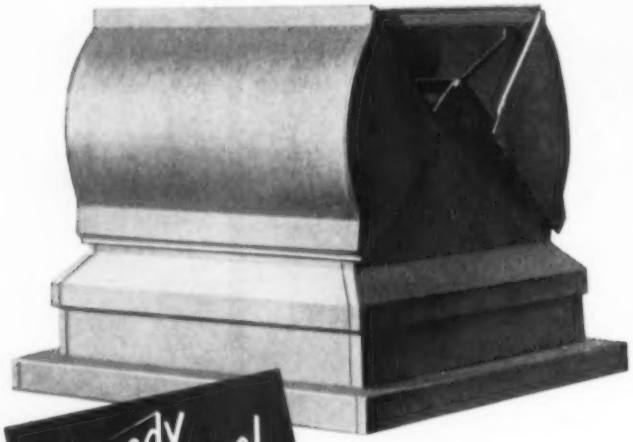
## 14—FLEXIBLE TUBING

**Is abrasion-resistant metal for handling of granular material**

This tubing is intended for conveying grain, rough forage, slag, insulation and other granular materials. Of galvanized steel, the tubing is described as fully-interlocked, incorporating a steel strip inner liner as an integral part of the tube. This liner laps over spaces between convolutions to give a smooth inner surface and protect surface of convolutions.

The abrasion resistant feature is intended to reduce friction and allow free



Speedy Removal of Bad Air

with this powerful straight-through

Ject-O-Valve®

Soundly designed and built to stand long hard use, Ject-O-Valve gives maximum and economical service for smoke, fume, dust or heat problems that only *power* ventilation will solve. Air stream from fan holds top sections open—sweeps away all weather. With motor off, top closes tight—completely weatherproof.

Write today for data on Ject-O-Valve and 6 other quality Swartwout Ventilators. Ask for Bulletin 338D.

Entire top is hinged for easy servicing of motor-propeller unit.

18511 Euclid Avenue, Cleveland 12, Ohio

The Swartwout Co.

Industrial Ventilation Specialists Since 1904

Equipment for Controlled Air Circulation

# Which tool do you need to loosen nuts?

**Monel nuts on steel bolts and studs can save a lot of trouble when you're taking apart pipe joints or machinery.**

*H*ow would you like to get some important advantages of a Monel® *nut and bolt* for just the price of the Monel *nut?*

You can . . . by making a practice of putting *Monel* nuts on *steel* bolts and studs.

With Monel nuts on the job, you'll always be able to undo the nut with a wrench. There'll be no more time and money lost by having to remove balky fastenings with a cold chisel, a cutting torch, or hacksaw.

Monel resists corrosion by salt water, caustics and most acids. Monel is completely rustproof.

Monel is 20% stronger . . . 30% more ductile . . . 40% tougher than the free-cutting steel used in ordinary fastenings.

Monel retains most of its strength at elevated temperatures up to red heat or at liquid-air cold.

So take advantage of the "extras" you get with Monel. Try Monel nuts on steel bolts and studs; try *all-Monel* fastenings wherever ordinary fastenings fail. Monel fastenings are available in any type, any style.

• • •

*FIND OUT FOR YOURSELF* how inexpensive it is to use Monel nuts. Write to Bob Johnson at INCO for a price on the type and size you need. He'll send a quotation . . . plus the address of your nearest supplier.

*Here are some places you can use Monel Nuts*

| | |
|---|---|
| Furnace parts | Heat exchanger equipment |
| Steam lines | Tank tie rods |
| Effluent lines | Paper machinery |
| Valve flanges | Process plant equipment |
| Pump stuffing glands | Pipe lines |
| Engine studs | Pipe lines aboard ship |
| Machinery studs | Mountings |
| Electrical connectors | Hangers |
| Exhaust pipe flanges | Covers and pans |

*. . . and anywhere a bolted joint should be easy to loosen at all times despite exposure to heat, moisture and corrosive liquids, solids or gases.*

## *Monel Fastenings*

*are stronger . . .*
*tougher . . . safer*

EMBLEM OF SERVICE INCO TRADE MARK

**THE INTERNATIONAL NICKEL COMPANY, INC.**
***67 Wall Street, New York 5, N. Y.***

flow of material with minimum of clogging. Chicago Metal Hose Corp.

## 15—PROTECTIVE TAPE

**For corrosion prevention, is applied cold in a single operation**

Polyken Industrial Tape is described as an oriented polyethylene film with a synthetic adhesive on one side, and is intended for application without the use of heat or other agents. Polyethylene is a plastic noted for electrical and chemical resistance properties and the process of calendar orienting used in the maufacture of Polyken is reported to give tape greater strength and elasticity. Because of its elasticity Polyken is said to maintain a permanent pressure around the metal coated with it which is equal to tension used in applying it. This pressure is credited with preventing flow of moisture between tape and metal.

In black or aluminum color, tape is 0.009 in. thick and supplied in various widths on cores of 1½ or 3 in., in 100 ft rolls, four squares per case. Bauer & Black, Div., The Kendall Co.

## 16—SHOCK ABSORBERS

**To prevent shock and hammering in pipe lines, liquid systems**

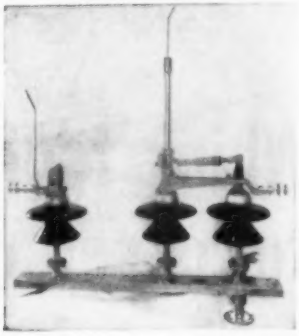
With these shock absorbers hammering, leaky joints, opened pipe seams and excess pressure on valve packings can be reduced to minimum, company reports, when such damage is due to quick closing of valves or any action suddenly stopping flow of liquid through a pump or other apparatus. Company's Industrial, Dual and Super models are for general industrial use.

A rubber cushion encased in a spherical metal chamber is provided to absorb shock; there are no moving metal parts. Cushion pulsates constantly, according to increase or decrease of pressure in the system, company explains. Can be installed in any position. R-S Products Corp.

## 17—DISCONNECTING SWITCH

**Is braidless type, rated for 7.5 to 69 kv outdoor service**

The Type RF switch is a rating extension of company's high-voltage (115, 161, and 230 kv) units previously available. It features silver-to-silver line pressure contacts, a simplified operating mechanism, and elimination of current-carrying braids. On hinge end of switch, the silver surface of the movable blade engages the silver surface of a U-shaped clip backed by adjustable stainless steel compression springs.



Clip contacts, also braidless, have silver-to-silver line-pressure contacts. They close under a positive, controlled pressure. Blade operating mechanism is described as simple, and antifriction bearings are used on main moving parts. Because of its design, the switch is said to be easy to operate under "glaze storm" and other severe weather. Switchgear Divs., General Electric Co.

## 18—COLD LIQUID CLEANER

**For use on electric motors and generators, machine maintenance**

Cleaning Mixture 49 was developed for rapid and low-cost cleaning. It dissolves grease rapidly, evaporates quickly and is practically inert to ordinary electrical insulating materials, company states. The formula is composed of 30 per cent by volume of company's Blend CC 49 and 70 per cent Stoddard Solvent. Those who prefer to prepare mixture themselves may purchase ingredients. Because of low flammability and mild toxicity Cleaning Mixture 49 is said to be easily handled. E. I. duPont de Nemours and Co., Inc.

## 19—DUST COLLECTORS

**Heavy-duty portable units in 450, 900, 1800 cfm capacities**

The Type M Dust Collectors handle dust from grinding, buffing and polishing metal-working machines and similar dust sources. Each unit consists of motor, exhauster, centrifugal pre-cleaner and steel wool filter after-cleaner.

Dust laden air is delivered to pre-cleaner where all but finest particles are removed. Air then passes through filter

**Hang your headaches on "sky hooks"**

✓ SPEED PRODUCTION AND BOOST PROFITS WITH Richards-Wilcox CONVEYORS

Stove parts entering degreaser on R-W ZIG-ZAG Continuous Power Conveyor.

Been wondering what to do about rising manufacturing costs? Even with plant personnel working at top speed, is your production rate still a problem? Your answer could easily be conveying equipment!

In today's highly competitive markets, plants with R-W Conveying Equipment are operating *more efficiently, more profitably.* Yours can, too!

**R-W Conveyors Serve *All* Industry**—Richards-Wilcox Conveyor Equipment is a major part of production and processing lines in every imaginable industry . . . increasing efficiency, cutting costs in the handling of light, medium and heavy materials. Why not have an R-W Consultant show you how conveyor equipment, engineered for your production requirements, can step up efficiency and boost profits. Just write or phone the nearest R-W branch office for free consultation—there's absolutely no obligation.

**R-W CONVEYORS FOR ALL JOBS**

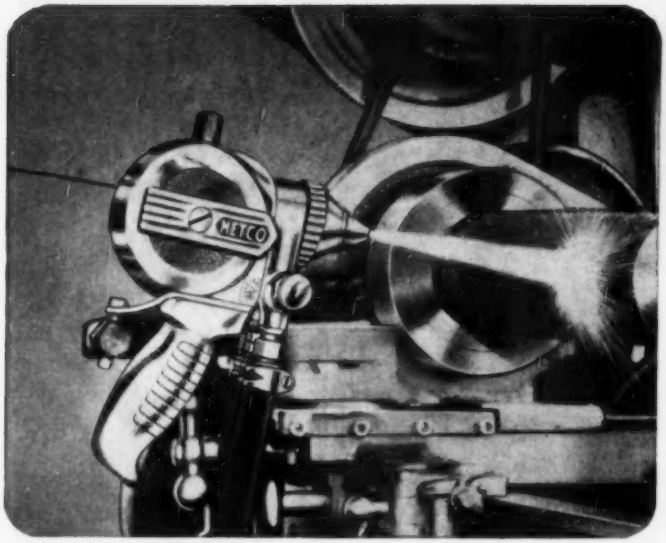
**"ZIG-ZAG" Continuous Power Conveyors** — Unique powered chain conveyor with extreme flexibility. Designed especially for carrying light loads within confined areas—handles products through degreasers, dip tanks, spray booths, ovens, etc.

**"LOCK-JOINT" Trolley Track Over-Way Conveyors** — Designed for handling light to medium loads, and maximum flexibility. Maximum capacity 3,000 lbs.

**"TRU-TRED" Steel Beam Over-Way Conveyors** — For heavy-duty handling and electric hoist service with minimum superstructure—eight different track sizes. Maximum capacity 8,000 lbs.

1880 R-W 1950
Reg. U. S. Pat. Off.
OVER 70 YEARS

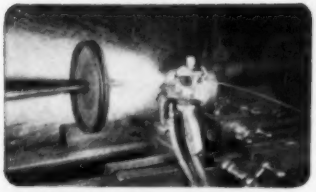
**Richards-Wilcox Mfg. Co.**
"A HANGER FOR ANY DOOR THAT SLIDES"
AURORA, ILLINOIS, U.S.A. Branches in all principal cities




# now a really low-cost metallizing installation...

## with the new Metco L-Gun

**New, low, compressed-air requirements . . . only 10 cfm at 40 to 60 psi, already available in many shops, or supplied by inexpensive 3 hp compressor . . . bring metallizing within reach of the small user.**



Metallizing damaged journals on turbine shaft

Building up worn brake-drum

Metallizing protective coating on steel plate

Here's a chance for the smaller maintenance shop to get into profitable metallizing operations like these:

- Save up to 90% of replacement costs on machine repair jobs,
- Do your own hard-facing,
- Apply long-wearing corrosion-resistant coatings to exterior plant structures, tanks and other equipment.

**Sprays 23 Different Metallizing Wires**—With the new L-Gun you can spray .10, .25, .80 carbon steels, stainless; babbitts, brass, bronze; nickel, aluminum, tin, zinc; special hard-facing materials such as Metco-Weld H, and the new self-bonding spray wire, Sprabond.

**It's Versatile**—Use the L-Gun machine-mounted or hand-held—it weighs only 4 lb. 2 oz. Do all kinds of metallizing work—shaft and bore build-up with harder, longer wearing metals; build up worn pump plungers, crankshafts, motor shafts; apply corrosion-resistant coatings. There are hundreds of different jobs that are "naturals" for metallizing.*

**Same High Quality as Other Metco Guns**—The low air requirements of the new L-Gun have been achieved without any sacrifice in Metco quality. It embodies new developments in turbine and nozzle construction—is built, like all Metco guns, for rugged, dependable service.

**A Real Opportunity for the Smaller Shop**—Thousands of large, well-known companies have been metallizing users for many years, not only in maintenance but in production applications on original equipment. Now, with the development of the new L-Gun, and a low cost installation, metallizing is within the reach of even the smallest plant. (We'll be glad to send you the names of some Metco users—large and small.)

**Free Bulletin or Shop Demonstration**—Send off the coupon for the detailed information Bulletin 55 gives you. Or, better still, ask for a demonstration in your own shop by a Metco Field Engineer. He'll be glad to show you how the new Metco L-Gun works on some job of your own. No obligation, of course.

***Where NOT To Use Metallizing**—Metallizing is a practical, low-cost method of performing literally hundreds of maintenance and production operations. Briefly, it can be used wherever metal build-up is desired—*except* 3 types of parts: those subject to *impact* (such as dies, punches); *point stress* (ball bearings); or *elongation* (gear teeth, threads). Use it anywhere else, but whenever in doubt just drop us a line.

The following names are the property of Metallizing Engineering Co., Inc.—METCOT, Sprabond, Metco-Weld. †Reg. U. S. Pat. Off.

**METALLIZING ENGINEERING CO., INC.**
38-13 30TH STREET — METCO — LONG ISLAND CITY 1, N. Y.

R. J. McWaters
**Metallizing Engineering Co., Inc.**
**38-13 30th St., Long Island City 1, New York**

☐ Please send me L-Gun Bulletin 55:
☐ Arrange a free demonstration in my shop:

NAME_____
COMPANY_____
ADDRESS_____
CITY_____ STATE_____

IF
CONSTANT VOLTAGE
PRESENTS A
PROBLEM

# STABILINE
## CAN HELP YOU

STABILINE Automatic Voltage Regulators maintain a constant output voltage, regardless of variations in input voltage or load current. They need no attention—are trouble- and maintenance-free over long periods of continuous operation.

**STABILINE Type EM** (Electromechanical) is recommended where long-term stability for 24-hour line correction is necessary. Available for 115, 208, 230, 440 volt, 1 and 3 phase ratings; capacities up to 100 KVA.

**STABILINE Type IE** (Instantaneous Electronic) gives line stabilization of ±0.1%; regulation of ±0.15%. Waveform distortion *never* exceeds 5%. Available in a wide range of capacities.

**IF YOU HAVE A PROBLEM** regarding the control of voltage in your plant or laboratory, write us about it today — no obligation.

THE
SUPERIOR ELECTRIC
COMPANY
1603 MEADOW ST.
BRISTOL, CONN.

pads for final cleaning. It is pointed out that motor and exhauster are isolated from dust and units are fire proof. Exhausters are heavy duty industrial type, direct connected to a 3600 rpm, 220/440 v motor, which is ventilated and accessible through removable metal panel. Dust receptacles are gasketed sliding doors.

Where conditions don't permit re-entry of cleaned air into working area, filters are replaced with air-tight closures and air vented to outside. Exhaust stack connections available. The Kirk & Blum Mfg. Co.

### 20—FLEX-HEAD WRENCHES
**To provide greater clearance when working under obstructions**

The double hexagon, broached heads of these chrome plated wrenches flex over 180 deg to give all angles of turning action. With handle in vertical position, nuts can

be spun on and handle then flexed over for final tightening. With handle in horizontal position little overhead clearance is necessary.

Wrenches have different size openings at each end and come in six sizes from $\frac{5}{8}$ to $\frac{3}{4}$ in. Lengths range from $5\frac{5}{8}$ to $8\frac{3}{4}$ in. Snap-On Tools Corp.

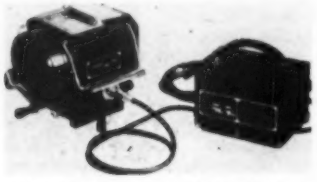
### 21—STORAGE SYSTEM
**For handling small parts, utilizes transparent plastic trays**

This system features a combination of steel shelf racks and two sizes of plastic trays. A complete unit consists of shelf section $34\frac{1}{2}$ in. wide, $14\frac{3}{8}$ in. high, and $11\frac{5}{8}$ in. deep with as many as 56 plastic trays, each tray having four removable partitions for storing small tools, screws, bolts, nuts, instrument parts. Individual shelf sections can be stacked to any height and are intended to fit into standard metal shelving.

Tray sizes are $11\frac{5}{8}$ by 2 by $2\frac{3}{4}$ in. and $11\frac{5}{8}$ by $3\frac{3}{4}$ by $2\frac{3}{4}$ in. Trays are molded transparent Polystyrene with index-card slot and molded in finger pull at front. Complete units or separate trays may be purchased. Andrew Technical Service.

### 22—INSULATION TESTER
**Is engineered for either hand crank or rectifier operation**

This Megger consists of the "Meg" type constant pressure test set and a separate rectifier which supplies 500 v d-c from any 115 v a-c, 60 cycle outlet. One cord from the hand-crank instrument and another from rectifier to a-c outlet eliminate hand operation, company explains.



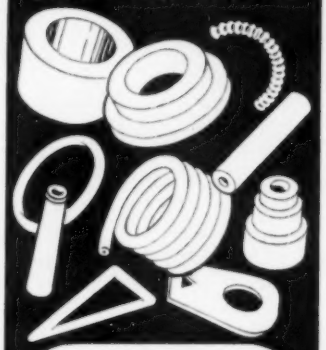
This dual operated instrument is expected to have its most important application in extensive cable wiring and control installations where an a-c outlet is readily available, and to be especially valuable where continuous operation of instrument is desired. James G. Biddle Co.

### 23—FLOOR CLEANER
**Uses dampened cloth to pick up fine dust, grit and soot**

The Damp-Sweep Tool is a broom-type sweeper. A 40-in. sq cloth with taped hole

Do you want more information on this equipment and its application? Use the no obligation, no postage card between 29-30 and 79-80.

Chemical Resistant
RUBBER PARTS



**FEATURE LONG SERVICE LIFE UNDER HIGHLY CORROSIVE CONDITIONS**

Chemically resistant rubber parts fabricated from new STALLITE 863 are recommended for applications involving concentrated or diluted chemicals. Parts fabricated from STALLITE 863 withstand aniline, acetone, ethyl chloride, and numerous other chemicals. In addition, this newly developed rubber has high resistance to animal fats, vegetable oils, ozone, oxygen, acids, alkalies, steam, extreme weathering, sunlight, and dry heat.

STALLITE 863 rubber parts have outstanding flex and abrasion resistance, and their dielectric properties make them suitable for many applications in electrical equipment of all types.

STALLITE 863 rubber parts have durometer hardness ranging from 40 to 80, tensile strength up to 2000 pounds per square inch, and elongation up to 500%.

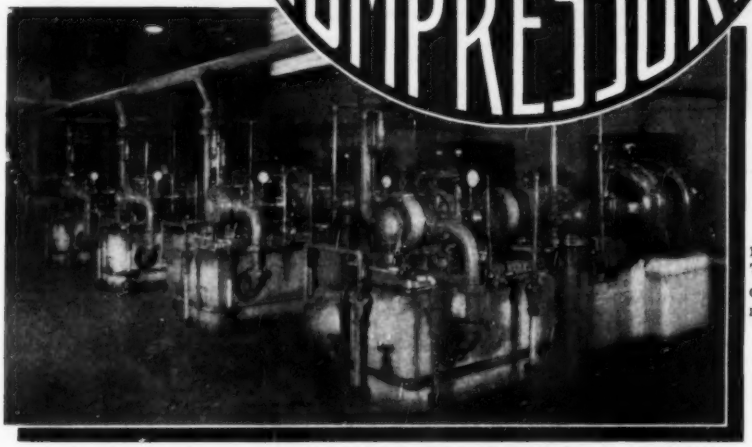
*Write Today*
*For Complete Information!*

STALWART
RUBBER COMPANY
*Specify Stalwart for Quality Custom Rubber Products*
3272 NORTHFIELD ROAD
BEDFORD, OHIO

**CAPACITIES TO 3300 C. F. M.** ACTUAL FREE-AIR DELIVERY

# FULLER ROTARY COMPRESSORS

**PRESSURES TO 100-125 LB. GAGE**



Installation of four Fuller Rotary Two-stage Compressors.

Capacity each, 490 c.f.m., 125-lb. gage pressure.

From time to time, we meet with potential compressor customers, who, for some unknown reason, have formed the opinion that Fuller Rotary Compressors are only good for low-pressure service.

This, however, does not agree with the facts, as we are in a position to furnish, and have furnished, hundreds of machines for 100 to 125-lb. pressure, which are giving the same efficient and dependable service as units for lower pressure ranges.

The first compressors built by this company (and which are still going strong), were of the two-stage type for 100-lb. service. It was some time before we began the manufacture of single-stage machines for the lower pressures required in various industries.

Bulletin C-5, illustrates and describes Fuller Rotary Compressors and Vacuum Pumps. We'll be glad to send you a copy. We invite your inquiries and investigation the next time you are in the market for compressors or vacuum pumps.

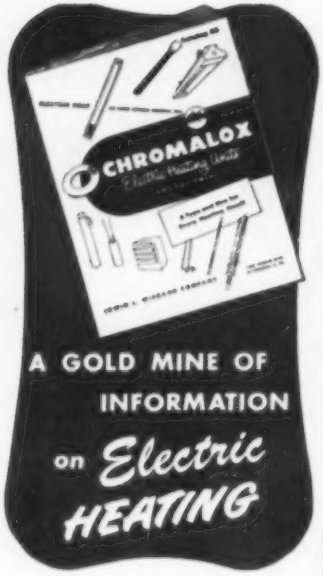
**FULLER COMPANY**
CATASAUQUA—PENNSYLVANIA
Chicago 3 - 120 So. LaSalle St.
San Francisco 4 - 420 Chancery Bldg.

No. 1 of a series

C-191

A LIFETIME OF NEW MACHINE EFFICIENCY

FULLER




A GOLD MINE OF INFORMATION on *Electric* HEATING

**The New CHROMALOX CATALOG 50**

If you use HEAT in any form in your plant —for processes or on production lines— it will more than pay you to send for this catalog. It's packed with specifications for many types of CHROMALOX electric heaters for liquids, solids, air and other gases; also shows the new CHROMALOX all-metal Radiant Heater and a complete line of electric unit heaters. Catalog 50 includes valuable application and calculation data.

**Write Today for YOUR Copy of CATALOG 50**

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Please send me free copy of CATALOG 50

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Company
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City Zone
State

**CHROMALOX**
ELECTRIC HEAT FOR MODERN INDUSTRY


at its center is dampened and slipped over handle and wrapped around a brush element before sweeping. The brush element is intended to hold the cloth against the floor, rather than sweep up dirt.

A universal joint-type attachment joins sweeper's 5-ft handle to the brush, and permits handle to be rotated while brush remains on floor. It also permits operator to maneuver sweeper around corners, in confined areas. Walter G. Legge Co., Inc.

## 24—VARIABLE SPEED DRIVE

**Is low cost, packaged transmission unit for small conveyors**

The Model 20MT is complete with built-in motor, variable speed drive, and built-in two-stage spur gear reduction. It is only 17¼ in. long, 8⅝ in. high and 7⅛ in. wide. Drive is designed to deliver all speeds from the maximum down to zero and micrometer speed control is provided to permit rapid and close speed adjustment to 1/400th of dial periphery.

Available with a large number of ratios of spur reduction delivering speeds from 110 rpm to 6 to 5 rpm to 0, the unit can be furnished with motors of almost all current specifications, open or totally closed; or without motor, with standard input shaft for coupling to a shaft of the machine or separate motor. Graham Transmissions Inc.

## 25—FLOOR CONDITIONER

**For holding dirt on floor surface, keeping it out of room**

An important feature credited to this product is its attraction for dirt and dust. A few ounces of the liquid is said to draw dirt out of floor where it can be easily swept away. Since material is used sparingly, floor doesn't appear to be coated with any film, it is stated.

Conditioner also leaves air clean and fresh smelling, according to company, and preserves natural attractiveness of floor. Its use consists of an initial application that produces a light film over entire floor area, followed by a dry buffing. Afterwards the coating is used on mop or broom. The Tremco Mfg. Co.

## 26—BRAIDED AIR HOSE

**Long length, for use as air line in spraying equipment**

This hose is described as light and flexible. It is made with a red cover of tough, age-resisting stock with a smooth mold finish said to reduce the tendency to accumulate paint and dirt. It has strong cotton reinforcement and a special air hose tube from a balanced construction recommended as suitable for working pressures up to 150 lb.

The one-braided type is made in three sizes: ¼ in. (31/64 OD); 5/16 in. (⅝ in. OD), and ⅜ in. (11/16 OD). The two-braid is in 7/16 in. size (49/64 OD). The B. F. Goodrich Co.

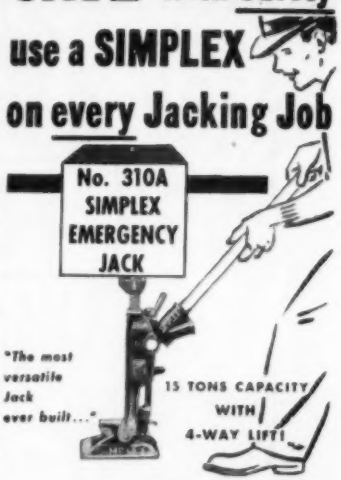
## 27—TEMPERATURE RELAY

**Is developed for use on insulated, air-cooled transformers**

The Type TRA Relay for turning on cooling fans and operating alarms as transformer loads increase beyond normal self-cooled ratings is available for company's transformers, Type ASL, Class B.

Operation of relay is coordinated with hot-spot temperature of transformer wind-

**SAVE—with Safety use a SIMPLEX on every Jacking Job**




● Save time and money on every job with this easy-to-use, Simplex Emergency Jack that is engineered for safety. Jack tilts on base for angular operation. Lifts full capacity on cap; on auxiliary cap shoe; on the machine serrated toe, or at any intermediate point by using chain as sling!

● **RATCHET LOWERING JACKS**
A Complete Line for Every Jacking Job
**Safe! Fast! Powerful!**
1½ to 35 Tons Capacity
For all general duty lifting, lowering, moving, leveling, skidding.

● **SCREW JACKS**
**88% Easier Lifting!**
**4-Way or Ratchet Head Types**
31 Models — 10 to 24 Tons Capacity
Single ball nested under cap won't flatten; cap can't slip. Friction reduced 88%. Malleable housings.

● **HYDRAULIC JACKS**
**Leakproof Neoprene Seals**
8 Models — 3 to 100 Tons Capacity
**Tested to 50% Overload**
For shops, factories, construction, transportation and mine jacking.

SEND TODAY FOR BULLETIN: INDUSTRIAL 49

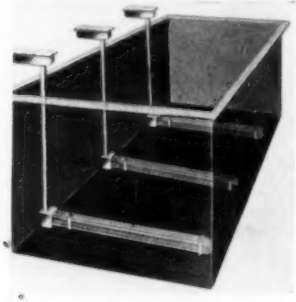
Simplex
LEVER · SCREW · HYDRAULIC
Jacks
TEMPLETON, KENLY & CO.
1066 South Central Avenue
Chicago 44, Illinois

. A 60-cycle, 240-v power source is ired to operate relay. This can be either source for fans or a separate power ply.
lay and associated equipment are nor- y factory installed, company points but provisions for future application his control can be made on any Type Transformer. Where forced-air cool- equipment is to be added to the trans- ter later, the new relay can be made perate an external signalling device zing approach of limiting operating perature. Westinghouse Electric Corp.

## —IMMERSION HEATER

**For oil and water solutions, tar, parrafin, glue, solvent cleaners**

se portable tank heaters are rated from 18 kw, 115 or 550 v, single or three- se, and available with copper, steel, nel or stainless steel sheath. Heating ients at bottom of vertical riser range 12½ to 53 in. long in straight sec- s, but may be supplied in circular



pe for round tanks with minimum ning of 10½ in. Riser can be fabricated engths to suit tank depth.
eated section can be had with two or e hairpin elements. A gasketed ter- al box with heat- and acid-resistant ing is mounted atop rise for user's 3-conduit line connections. Sludge legs available. Edwin L. Wiegand Co.

## —PRESSURE FEEDER UNIT

**Has control to compensate for differences in zone pressures**

s feeder is designed to feed material ch is at atmospheric pressure into a e which may be under pressure or uum. Company's Pneumatrols incor- ated in their unit allow a differential in sure between receiving point and dis- rge point. They may be thought of as ding conveyor into an atmospheric ion and a pressure or vacuum section, ending on requirements.
aterial may be fed into receiving hopper tinuously at atmospheric pressure. It onveyed through Pneumatrol into press- or vacuum section of conveyor and harged into container under same ssure or vacuum. Since conveyor is ed circuit, return run also has a Pneu- trol to retain pressure or vacuum in tainer. Process can be reversed by a nge in conveyor circuit, so material be taken from pressure or vacuum discharged at atmospheric pressure. man Conveyors, Inc.

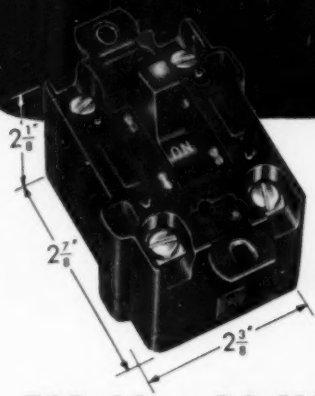
## —COAL CONVEYOR

**For filling of overhead hoppers on spreader stokers, two capacities**

hough especially suited for overhead pers, the Hi-Hopper Conveyor is also mmended for underfeed hoppers where acity has been increased by extending sides, to simplify hopper filling and end the period of stoker operation with- attention. This conveyor is also sug- ted for use as a flat conveyor or for nming bins.

Do you want more information on this equipment and its application? Use the no obligation, no postage card between 29-30 and 79-80.


# DEPENDABLE ACTION POSITIVE PROTECTION




ARROW AH HART

LOAD-LIMIT

## MANUAL STARTERS WITH OVERLOAD PROTECTION

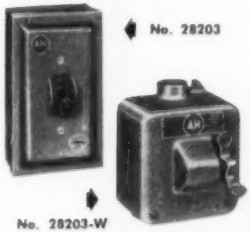
## FOR AC or DC MOTOR CONTROL

Over 100,000 Arrow-Hart "LOAD-LIMIT" Starters have been sold to satisfied customers who come back for more. They're easy to install, inspect and maintain — give you positive protection for operator, machine and work.

Ruggedness, dependability and long, trouble-free service are built into each unit; each component is designed to serve the most exacting requirements. Looking for quality, economy and flexibility in your motor controls? Specify, buy or use this Arrow-Hart "LOAD-LIMIT" Manual Starter for complete satisfaction.

### ✓ CHECK THESE FEATURES

**A-H exclusive design in release gives positive overload response • Positive trigger and latch gives dependable tripping • Push START button to relatch, reset • All components vibrationproof • Interchangeable heaters to match motor ratings • Control 2 motors with 1 unit • Mount front or back of panel up to ½" thick.**



No. 28203

No. 28203-W

The A-H "LOAD-LIMIT" Manual Starter is made in types to suit every need — in 2-, 3- and 4-pole models, in ranges to give overload protection to motors rated up to 5 H.P., single and polyphase, through 440 Volts AC and 2 H.P., 230 Volts DC, listed as standard by U.L. The Standard model can be surface mounted — and, by means of springmount screws in case, can be mounted in front or back of panels up to ½" thick. Weatherproof models are tightly sealed to perform under the most adverse conditions; are available in same range of ratings as Standard types. One case is used for all sizes of units.

CONTROLS and APPARATUS FOR *Outstanding* PERFORMANCE

ARROW AH HART

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HARTFORD 6, CONN.

ARROW-HART

THE ARROW-HART & HEGEMAN ELECTRIC COMPANY
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BRANCHES IN: BOSTON, CHICAGO, CLEVELAND, CINCINNATI, DALLAS, DENVER, DETROIT, LOS ANGELES, NEW YORK, PHILADELPHIA, SAN FRANCISCO, SYRACUSE

*Stock available at all branches except New York and Denver.*

IN CANADA: ARROW-HART & HEGEMAN (CANADA) LTD., MT DENNIS, TORONTO

A CLEAN Plant
Is a SAFE Plant

**TORNADO***

one-stroke, positive pick-up
*Industrial*
VACUUM CLEANER

The **TORNADO*** Method is the accepted, approved method of good "shopkeeping" and preventive maintenance. Reduces plant hazards.

**TORNADO*** is fast, thorough and efficient. Reduces labor and maintenance costs because one-stroke over the surface is all that is required. No need to waste time by restroking. Picks up wet and dry substances as they come—water, machine oil and other wet substances without machine adjustment. Leaves surface **safe** for workers. Increases morale. Eliminates health hazards.

**TORNADO*** **does all plant maintenance work with one machine.** Motor unit removed in seconds to become a powerful, portable electric blower. Clean dry air blows out dust, dirt, grime and abrasive grit from interiors of motors, machinery and overhead equipment to reduce friction and hold breakdown to a minimum. Equipped with tank, it becomes an efficient insecticide sprayer which shoots a fine mist to a distance of 50 feet. May be further converted into a compact, pack-carried vacuum cleaner for use in congested areas and other confined places.

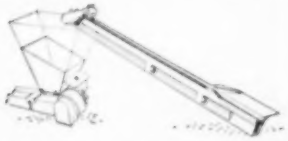
Proved by over 16 years of industrial service to be the most practical cleaner for all plant maintenance. A clean plant is a safe plant.

Bulletin 592 contains complete information. Write for it.

*Trade Mark Reg. U. S. Pat. Off.

**BREUER ELECTRIC MFG. CO.**
5086 Ravenswood Ave., Chicago 40, Ill.

Of all-welded steel, the Hi-Hopper is made in two standard models, but custom-built conveyors are available. Model MM4 has a 4 in. belt and 25 t per hour capacity, weighing only 135 lb in the 12 ft length. It can be supplied with undercarriage for



portable installation. Model MM8 has 8 in. belt, and 60 t per hour capacity and is recommended for permanent installation where large tonnage is involved. Prices begin at $195. New London Engineering Co.

## 31—STEEL STOCK RACK

**For easy stacking and handling of coil steel or wire**

Concave-shaped guards are provided to make load rest snugly in this rack and eliminate contact with dust and dirt of floor and danger of load falling when rack is lifted. Units may be handled by fork truck or overhead equipment. Racks are built to required size and load capacity and color of paint is optional. Palmer-Shile Co.

## 32—SET SCREW

**Is self-locking, available in many metals and head types**

The Zip-Grip Self-Locking Screw is designed for set screw applications in which excessive vibration is a factor, and for regulating and adjustment uses in which instantaneous locking at a precise point is desired.

The lower part of the screw which enters the hole first has a standard thread; the

upper section has a larger pitch diameter of the thread section which is intended to create an interference fit or expansion effect against the thread flanks. This is said to result in a tension or opposed-force action, causing thread section of upper part to be drawn downward and that of lower part to be drawn upward in direction of screw's locking action against shaft. Set Screw & Mfg. Co.

## 33—ALARM SYSTEM

**For use in hazardous locations and corrosive atmospheres**

Series 400 alarm signal units are hermetically sealed relays on a sealed plug-in octal socket. System conforms with National Electric 1947 Code specifications for Class 1, Div. 2 installations. Many combinations of light and sound signals are available to warn of abnormal operating conditions. System can be used for monitoring speeds, time cycles, pressures, temperatures, liquid or gas flow or equipment operation. Panalarm Products, Inc.

## 34—FLOOR COATING

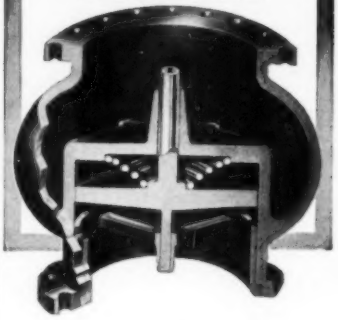
**Is intended to stop dusting and disintegration of concrete floors**

According to company, you simply flush and brush Stontop on new or old concrete floors and it makes the floors harder, more dense, and highly resistant to abrasive wear, syrups, acids and water. Stonhard Co.

From Small Schools to Huge Plants...

**WATER HAMMER is serious**

*but is so easily eliminated with*
THE WILLIAMS-HAGER
*flanged* SILENT CHECK
**VALVE**

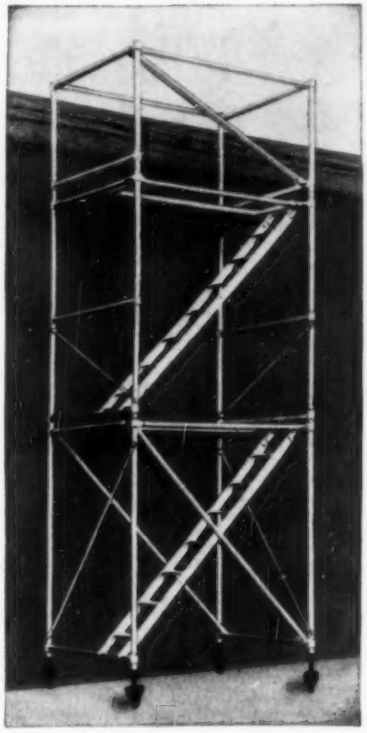


Write for complete information on The Williams-Hager Flanged Silent Check Valve—that has proven successful on the most difficult installations.

**THE WILLIAMS GAUGE CO.**

Pump Valves . . . Water Gauges . . . Gauge Cocks . . . Steam Traps . . . Pump Governors . . . Feed Water Regulators . . . Water Columns

2913 PENNSYLVANIA AVE. · PITTSBURGH (12), PA.



# Aluminum Rolling Scaffold

***Two Types — Stairway Type (illustrated) and Ladder Type***

***By the makers of Gold Medal Ladders & Scaffolding***

For those who want the latest in rolling scaffold design, we offer the Aluminum Rolling Scaffold.

- LIGHT IN WEIGHT
- EASY TO ERECT — Aluminum makes parts light and easy to handle.
- SAFE — Cross bracing assures a rigid scaffold.
- VERSATILE — Interchangeable parts permit scaffold of one or more sections.

Tubelox Scaffolding is also available with aluminum tubing.

*WRITE FOR FREE BULLETIN*

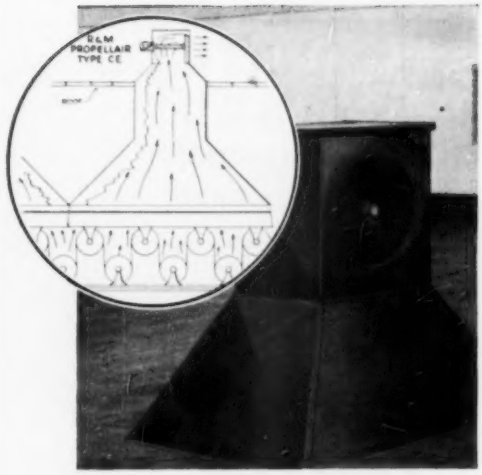
Gold Medal Ladders & Scaffolding

*for Greater Safety...Efficiency...Economy*

THE PATENT SCAFFOLDING CO., Inc.

38-21 12th STREET, DEPT. PE LONG ISLAND CITY 1, NEW YORK

See Your Classified Telephone Directory for Nearest Office




# TAKING THE STEAM OUT OF THE ROLLER

## ...PROPELLAIR helps make "paper profits" real

It was a familiar problem to Propellair engineers—moisture removal. A large Eastern paper manufacturer was troubled by steam forming over drying rolls. Sixteen Propellair extension shaft fans came to the rescue. These fans are mounted in vertical stacks rising out of the hoods surrounding the paper-drying machines. Motors are mounted outside the stacks away from dampness. Many tons of moisture are removed daily by this set-up.

## PROPELLAIR FEATURES

Blades are actual airfoils, give greater efficiency. Perfection of entrance housing lowers entrance losses. All motors carefully constructed for fan duty applications. Special moisture-proof, explosion-proof and glass-insulated motors on request.

## VARIETY AVAILABLE

Propellair comes in many sizes and designs to give top performance for any application. Our engineers will advise you on installation of extended shaft, direct connected, belt drive, cradle mount, pedestal mount. Propellair provides the economical, efficient solution to all ventilating problems.

*Write, Wire, or Phone for Details*

PROPELLAIR

DIVISION OF ROBBINS & MYERS, INC.

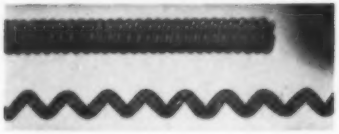
SPRINGFIELD 99 OHIO

# ELIMINATE HAZARDS

**OF TRIPPING, TANGLING STRAIGHT CORDS...**

**USE NEAT, OUT-of-the-WAY**

***Koiled Kords***



One foot of neat Koiled Kord extends to approximately five feet, then retracts to its original length. Koiled Kords eliminate all the hazards of dangling straight cords on any electrical equipment that moves. They are safe, convenient and economical. Koiled Kords come in standard lengths of tire-tread neoprene-jacketed power cord or can be made to specifications.

## DYNAPRENE

**Neoprene-Jacketed Flexible Cords**

Where the retractile qualities of Koiled Kords are unnecessary, use DYNAPRENE Flexible Cords. They resist abrasion, acids, grease and light and last far longer than rubber-jacketed cords yet the price is only slightly higher.

**Be sure to specify type SO or SJO for your flexible cord requirements.**

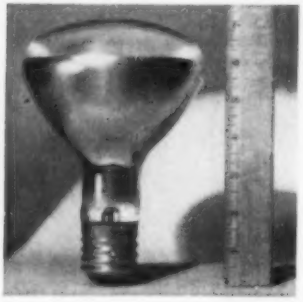
***Koiled Kords***
INCORPORATED

**BOX K,**
**HAMDEN, CONNECTICUT**


## 35—REFLECTOR SPOT LIGHT

**Has heat-resistant, hard glass bulb and mogul screw base**

This is a 300 w, 5-in. face dia lamp. Spot distribution of light—described as first time made possible in a hard glass reflector lamp—is credited to a method for lightly frosting the inside of the face of the bulb. Intended for outdoor use this lamp is designed to provide a small spot of light brighter and for longer distances than can be obtained with flood lamps, company points out.



The heat-resistant glass bulb of this lamp is said to withstand thermal shock of drops of water, oil and grease more effectively than lamps without this glass. Costs $3.60. Lamp Dept., General Electric Co.

## 36—BELT FEEDER

**Is enclosed, but accessible, for installation in tight places**

Originally designed to deliver a continuous stream of material from an intermittently discharging automatic bulk scale, this unit also has applications as feeder or "take-away" conveyor. A variable speed drive can be furnished to vary the stream in conformity with timed discharges of automatic scale above. Also has cantilever pulleys for endless belting, removable skirt plates.

Comes in lengths of 18 to 60 in. and in stream widths of 2, 4 and 6 in. with rated capacity up to 1500 cu ft per hour. Belt speed is from zero to 200 fpm. Can be driven by single speed motor at either end, from line shaft, or variable speed drive. Manual control, or special remote control is also available. Richardson Scale Co.

## 37—DRUM HANDLER

**Is revolving attachment for fork lift trucks; 2100 lb capacity**

The hydraulically controlled Revolving Barrel Grab is designed to lift and transport open-end drums and discharge their contents. It is suitable for straight-sided drums from 15 to 30 in. dia. The device is attached to the lifting carriage of the truck; to maintain constant pressure on the load throughout the 360 deg revolution, the hydraulic line operating the arms runs through the spindle of the carriage. Towmotor Corp.

## 38—FLUORESCENT SYSTEM

**Can be put together in combinations to fit illumination needs**

The Module system of lighting consists of four modules or units, each with single or multiple standard measurement of 16¼ in. These units can be put together end-to-end, side-to-side, or end-to-side, like children's blocks, to achieve an unlimited number of lighting patterns, including right angle turns.

Module A is 16¼ by 16¼ in. with four slimline or straight fluorescent tubes. Module B is same size with a circline or circular lamp and a spot or flood light incandescent in center. Module C is 48¾ by 16¼ in. and Module D is 97½ by 16¼ in., both with four straight fluorescent lamps. Use of modules in patterns or singly pro-

Do you want more information on this equipment and its application? Use the no obligation, no postage card between 29-30 and 79-80.


# Shaft Packing No Chemical Can Attack

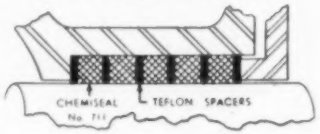
**Teflon "Chemiseal" #711 Packing Stays in Service Months Where Other Packings Failed in Hours**

"We've got a pump handling hypochlorites," a paper manufacturer told us, "and we can't find a packing that will last more than 5 hours." So we sent him a set of Chemiseal #711. It went into continuous service in November. It's still in there and going strong months later.

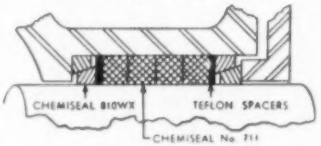
A steel plant tried a #711 packing last summer on a pump handling coke liquor. Recently they ordered #711 for 10 more pumps.

There are hundreds of similar cases in our files.

CHEMISEAL #711 SHAFT PACKING



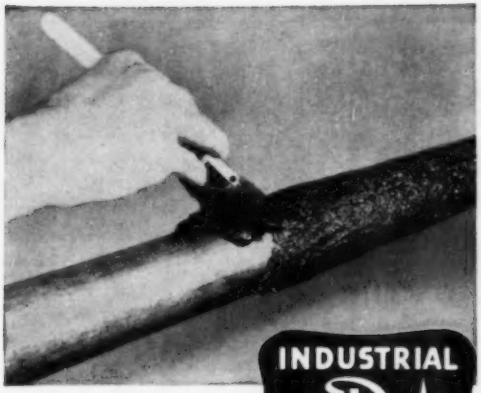

CHEMISEAL #711WX SHAFT PACKING




No chemical — acid, solvent, caustic, oil or gas—can attack or dissolve a Teflon Chemiseal #711 or #711WX packing. "Chemiseal" non-corroding, non-contaminating, heat-resisting gaskets, packings, adapters and expansion joints can save you hundreds of dollars and countless production delays.

*Phone, write or bring your gasket and packing problems to —*

**UNITED STATES GASKET CO.**
**648 N. 10th Street**
**Camden, New Jersey**



INDUSTRIAL NoDrip

## COVER PIPES, TANKS WALLS

Anyone can brush, trowel or spray NoDrip on any clean, dry surface. Goes on like plaster, forms a seamless, protective coating, **stops condensation drip.** NoDrip keeps equipment and floors safe and dry; prevents corrosion of metal and prolongs its life. Acid, alkali and brine resistant. Comes in 1, 5 and 55 gal. drums, ready for use.

**TRY NoDRIP**

Apply NoDrip to a small area, compare the results with uncovered portion.

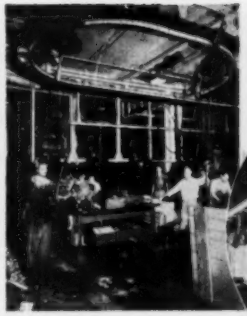
*Send for free NoDrip Handbook*

**J. W. MORTELL CO.**
537 BIRCH STREET KANKAKEE, ILL.

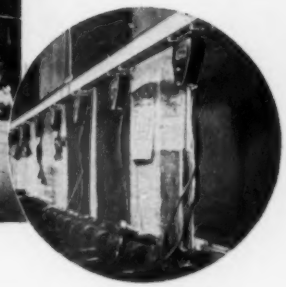
"LIQUIDS WORTH STORING ARE WORTH MEASURING" WITH A **LIQUIDOMETER** *Tank Gauge*

WRITE FOR COMPLETE DETAILS

THE LIQUIDOMETER CORP.
36-31 SKILLMAN AVE., LONG ISLAND CITY, N.Y.



*Overhead*

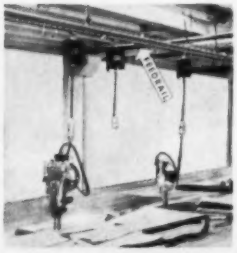


*On Test*

## IF IT MOVES it should be FEEDRAIL

*Production Line*

Ask any electrical maintenance man. He will say half his time is consumed in the repair of loose or exposed wires, and broken or faulty connections. Ask any safety man. He knows moving electrical equipment is one of the worst hazards in the plant. Then install Electric Feedrail, the modern, totally enclosed electric distribution system. Watch men work with portable tools connected to the overhead trolley with Ever-Lok trouble-proof connectors. See what it does for moving test lines, lights, cranes and hoists. Everywhere it speeds production, saves maintenance, and reduces electrical hazards.




**Ask for technical data and bulletins applying to your specific applications.**

*On the Bench*

26-A

FEEDRAIL CORPORATION
*Subsidiary of Russell & Stoll Company, Inc.*
125 BARCLAY STREET • NEW YORK 7, N. Y.

# NOT 1 CENT for Repair Parts for 444 Nicholson Steam Traps Installed in 2 Years

Here is added evidence of the remarkably low maintenance costs of Nicholson expansion steam traps. In the 2 years Bradshaw & Co. have been distributing them in the Pittsburgh area they have installed 444 traps. But they have received not one order for repair parts. And examination of traps in continuous drainage service for at least 18 months, at steam pressures to 250 lbs., showed no sign of valve cutting.

*Pressure: 0 to 250 lbs. without change of valve or seat. Length: 18" to 40". 2 types: thermostatic, continuous flow.*

**Easily Installed, Low Cost**

Because valve is easily adjusted to pass condensate at any temperature below 212° F., these traps are also widely used for regulating temperature of equipment.

**FOR ALL EQUIPMENT**
**Using Steam or Hot Water**

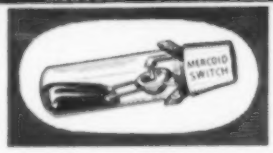
| | |
|---|---|
| Radiators | Dry Kilns |
| Separators | Vulcanizers |
| Paper Machinery | Switch Heaters |
| Pipe Coils | Laundries |
| Kettles | Plastic Molding |
| Railway Coaches | Presses |

**CATALOG 448**
**or see Sweet's**

**W. H. NICHOLSON & CO., 208 Oregon St., Wilkes-Barre, Pa.**



# MERCOID
MERCURY SWITCHES




*Superior Quality and Workmanship*

They are not affected by dust, dirt or corrosion and have many definite applications where open contacts are not suitable. Various types available. MERCOID is your guarantee of the best in mercury switches. Further information sent upon request.

# MERCOID
SOLVES INDUSTRY'S AUTOMATIC CONTROL PROBLEMS

catalog upon request

**THE ONLY 100% MERCURY SWITCH EQUIPPED CONTROLS**

Designed to automatically regulate electrically operated equipment in accordance with changes in temperature, pressure, vacuum, or fluid level.

**If you have a problem on the automatic control of pressure, temperature, liquid level, mechanical operations, etc., it will pay you to consult Mercoid's engineering staff — always at your service.**

**THE MERCOID CORPORATION**
4227 West Belmont Avenue, Chicago 41, Illinois

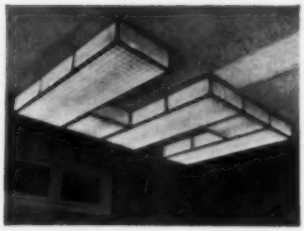
MANUFACTURERS OF AUTOMATIC CONTROLS FOR HEATING, AIR CONDITIONING, REFRIGERATION AND NUMEROUS INDUSTRIAL APPLICATIONS. ALSO MERCOID BRAND MERCURY SWITCHES.



# STOP LEAKS!

Quickly put on under pressure, without shutdown, Skinner-Seal Pipe Joint Clamps stop leaks at joints. Other clamps for other pipe leaks. Quick. Simple. Lasting repair. Write for catalog.

**M. B. SKINNER CO.**
SOUTH BEND 21, INDIANA, U.S.A.

duces equal brightness on all sides and ends, with no dark spots, according to company. A clamp connector has been developed to simplify installation and adding of new modules to existing patterns. Mitchell Mfg. Co.

## 39—ANGLE NEEDLE VALVES

**Are made with aluminum bodies and stainless steel stems**

These valves are designed to assure easy-to-open and easy-to-close finger operation, and to eliminate stem leaking. They are available with ¼ or ⅜ in. tube connections, and ⅛ or ¼ in. pipe thread connections. Kohler Co.

## 40—LAMP TESTER

**For fluorescent tubes and starters and incandescent lamps**

The Fluor-O-Lamp Tester will test 14, 15, 20, 25, 30 and 40 w tubes, FS 2, FS 4 and FS 25 fluorescent lamp starters, mogul single or double filament lamps and medium base lamps.

It can be used for portable or permanent mounting. Case is 20-gage steel with white enamel finish and rubber bumpers. Adjustable trolley accommodates various lamp lengths. Has momentary circuit-breaking control switch for operating efficiency and blowout prevention. Operates from 120 v, 60 cycle outlet. Weighs 10 lb. Gould Electric Supply Co.

## 41—ELECTRIC SAW

**Is portable tool with 6-in. blade, for heavy-duty service**

The Metalmaster Model 160 has an adjustable base to permit depth of cut adjustments and bevel cutting at angles from 0 to 45 deg. It is intended to cut to maximum vertical depth of 2 in. and minimum of ¾ in. At 45 deg angle maximum cut depth is said to be 1¼ in. and minimum ⅜ in.

Saw is powered by a universal 110 v a-c d-c motor which drives blade at 4000 rpm no load speed. A telescoping safety guard covers blade except while cutting. Blower-type fan is used to keep sawdust clear of cutting line. Overall length is 9 in., height 6¾ in., and width 8 in. Saw weighs 10 lb 4 oz, costs $59.50. Metal carrying case and rip gage are optional extras. The Bradford Machine Tool Co.

## 42—TRANSFORMERS

**For machine tool use, follow proposed NEMA standards**

These transformers are said to be particularly adapted to inductive, low-power factor loads of solenoids, relays, and contactors making up machine tool control equipment. Secondary voltage of these 60-cycle transformers remains above 90 per cent of rated voltage up to a load current of 7 times normal at 20 per cent load power factor.

Size and weight of transformers ½ kva and larger are low because of the use of type "C" Hipersil cores, it is noted. Circuit-breaker protection is normally supplied on ratings 0.300-kva and larger while on ratings 0.150-kva and smaller a block is mounted for customers' fuses.

Seven sizes from 0.075 to 1.5 kva are available for 220/440 v primary to 110 v secondary at 60 cycles. Transformers for 50-cycle operation come in six sizes from 0.150 to 1.5 kva for 208/220/380-416/440 v primary to 110/95 v secondary. Three sizes from 0.150 to 0.500 kva are available for 25-cycle operation at 220/440/550 v primary to 110 v secondary. Westinghouse Electric Corp.

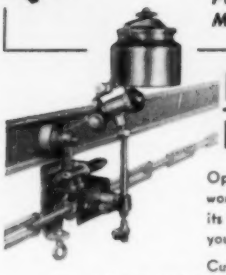
## 43—RUBBER MAT

**Is heavy-duty industrial type intended for severe service**

The PB non-skid surface mat is designed for use by operators of drill presses, lathes and other machinery. Several mats may be

## AUTOMATIC LUBRICATION

*for*
*Conveyor Bearings*
*Punch Press Dies*
*Metal Forming and Drawing*



## NEW AUTOMATIC LUBRICATING UNITS

Operates only when your equipment works—your equipment actually controls its own lubrication and the lubrication of your dies and materials formed or drawn.

Cut your production costs with these new, different and definitely dependable devices. They will save you time, labor, lubricant, cost of dies and will pay a high return on your investment.

Paasche Automatic Lubricating Units will always give the ideal film of lubricant at the right time and in the right place. Select the unit that is proven and accepted by leading industries.

*WRITE FOR BULLETIN LUB 8-49*

*Paasche Airbrush Co.*
1920 DIVERSEY PARKWAY CHICAGO 14, ILLINOIS

Paasche also Manufactures Artist Airpainting Equipment—Manual and Automatic Airpainting Equipment——Ventilating Equipment—Sterilizing, Fogging and Bacteria Control Equipment, etc.

## *Outwear ordinary work gloves 3 to 9 TIMES—Cut your costs*

**Edmont gloves coated with NEOX (reinforced neoprene)**

**resist cutting and abrasion as well as oil, acid, caustic, solvents.**

**Strong lining reinforces, prevents snags, makes gloves comfortable, easy on and off.**

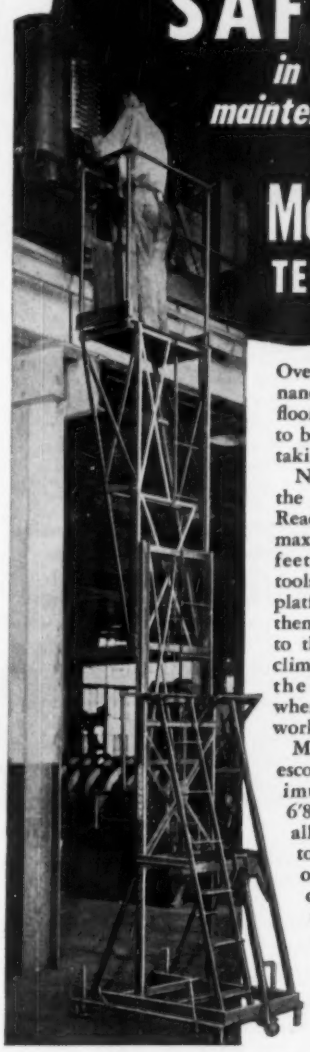
**In overall or palm and thumb coated styles. Also natural rubber or plastic.**

We can show you the records of many on-the-job tests, on a great number of operations, where workmen wore out 3 to 9 ordinary gloves on either hand, while wearing a single Edmont coated-fabric glove on the other. Direct cost-savings range from 40% to 70% on most work. Let us prove it.

**SPECIAL TEST OFFER** — Write today for sample, stating operation, material handled and temperature conditions. Recommended gloves will be sent without cost for comparative test and report. Address EDMONT MFG. CO. 547 Orange St., Coshocton, Ohio. World's Largest Maker of Coated Gloves.

**Edmont**
FABRIC-LINED
NEOX-COATED
**GLOVES**

## SAFETY *in factory maintenance work with a* Model PUL TELESCOPER ★



Overhead crane maintenance 22 feet above the floor, as illustrated, used to be a hazardous undertaking.

Now one man sends the platform of this Hi-Reach Telescoper to its maximum height of 15 feet, putting whatever tools he may need on the platform beforehand. He then walks up the steps to the first landing and climbs the ladder to reach the roomy platform where he is then able to work with full security.

Model PUL when telescoped down to its minimum height is only 6'8" high and 32" wide, allowing the machine to be taken through an ordinary doorway and onto freight elevators for transport to any part of the plant. Model PUL is equipped with basewheels and is fully portable.

### THREE STANDARD MODELS

| | |
|---|---|
| **No. 1 Platform lift, 10 ft. 9 in.** | **$280.00** |
| **No. 2 Platform lift, 11 ft. 9 in.** | **290.00** |
| **No. 3 Platform lift, 15 ft. 0 in.** | **315.00** |

***f.o.b. Chicago, freight allowed.***

Other Hi-Reach Telescopers available with platform lifts up to 60 feet.

*Write for full details of Model PUL and larger Telescopers.*

**ECONOMY ENGINEERING COMPANY**
**4527 W. Lake Street • Chicago 24, Illinois**

## "DOUBLE-DUTY"
### with SPEEDWAYS Roller Conveyors

The "Hi-Lo" Feature is one of the plus values you get with Speedways Roller Conveyors. "Hi" side permits moving units wider than frame. With conveyor inverted to "Lo" side, frame acts as guard rail for units to be moved.

Easy portability, sturdy construction and simplicity of hook up that requires no tools are other features of both Speedways *Wheel* and SpeedTUBE *Roller* Conveyors. Available in 12", 15", and 18" standard widths, with wheel and roller spacing to meet your requirements, in 5' and 10' straight lengths and 45° and 90° curves, you can set up a material handling line to move your products. Write for literature and the name of your nearest Speedways representative.

KEEP 'EM ROLLING WITH SPEEDWAYS CONVEYORS, INC.

1297 Niagara St.
Buffalo 13, N. Y.

*Represented and carried in stock by experienced material handling equipment engineers in principal cities. Also manufactured in Canada.*


laid together to cover large working areas, or they may be cut to surface stairs and small areas. Pattern design features large rubber blocks with a non-skid surface. Mat is grooved on underside to prevent slipping under wet or oily conditions. Priced at $8.00, over-all size is 32 in. sq. Patterson-Ballagh Div., Byron Jackson Co.

## 44—AIR FLOW METER

**For pressures up to 60 psi and flow rates up to 60 cpm**

Model B-1050 has a low constant pressure drop across a large-area vane, company explains, and slight fluctuations in air flow are followed closely by gear-driven pointer. High accuracy is claimed in indicating any flow within range of instrument, and no damage results from flow in excess of range.

Meter has flexible metal liner in flow chamber; its curvature is controllable by external adjustments to determine characteristics desired on scale. Strong zero vane torque is said to be accomplished by weighting vane tip, which also provides vernier adjustment to range scale limits. Movable element is cushioned.

Instrument dial is 4¼ in. dia, with 6¼ in. scale length. Meter body is aluminum with heavy removable front and back plates. Gravity zero return for vertical plane installation, or spring zero return for horizontal installation are optional. Selco, Inc.

## 45—UNIVERSAL CHUCK

**Is 3-jaw type designed to combine speed and powerful grip**

The "75" Chuck is engineered to provide the speed of a lever-operated chuck with the grip of a pinion-operated chuck. Lathe machinists can lock their work in place 10 times faster with this chuck, says its manufacturer, by inserting wrench stem into any of six holes in the outside diameter of the scroll and then rotating scroll rapidly by lever action. To secure a final tight grip, the machinist slips wrench stem into one of six additional holes adjacent to scroll so pinion on the wrench engages with bevel gear teeth at back of scroll.

Chuck is threaded for direct attachment to 1½ in. 8-thread lathe spindles and may also be used on milling machine dividing head. Net weight of chuck is 8½ lb. The body, 5 in. dia, is semi-steel and scroll is a durable alloy. Accuracy is guaranteed to center within 0.003 in. total indicator reading. Threaded steel mounting plate is available. Westcott Chuck Co.

## 46—STACKING UNIT

**Of 1000-lb capacity, it is designed to lock automatically**

Of fabricated construction throughout, this stacker utilizes company's Portelvator lifting principle. Maximum height of platform surface from floor is 58 in.; minimum, 6 in. Platform automatically locks wherever it is stopped, according to manufacturer, and cannot slip or settle under load.

Platform movement is accomplished through hand crank, roller chain, meshing bevel gears and screw. This method is said to give platform extra rigidity and provide operator with greater safety. Provision is made for rapid platform movement under light loads. It is reported, and stacker is equipped with pressure grease fittings for low maintenance. Platform is 26 by 24 in. Over-all height is 70 in., width 32 in., and length 42 in. Weight is 328 lb. Finish is green. The Hamilton Tool Co.

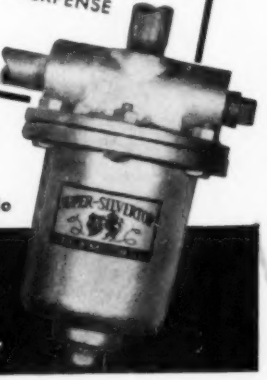

## Here's the RIGHT FORMULA for choosing STEAM TRAPS

Be sure you use the right formula in figuring its cost when you choose a steam trap. *Purchase price alone never gives a true cost picture.* Figure the installed cost (adding installation and maintenance costs) and you've an honest picture of steam trap costs.

Super-Silvertop Steam Traps always assure lower ultimate cost. The conventional trap requires costly fitting and labor to get it installed, while Super-Silvertops fit snugly as a pipe union or elbow . . . saving up to nine fittings plus sixty minutes of installation time. In addition, Super-Silvertops save forty-five minutes whenever you replace a part or clean. Use the right formula in figuring trap costs, and you'll choose Super-Silvertops every time. Write for free copy of "Solving Steam Trap Problems" which gives further information on cutting steam trap costs.

**RIGHT FORMULA**

X=PURCHASE PRICE OF TRAP
Y=COST OF INSTALLING TRAP
Z=COST OF MAINTAINING TRAP
X+Y+Z=TOTAL EXPENSE

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Yes, I want to save money on cleaning costs. Send me full information without obligation.

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Company.....

Address.....

City.....Zone.....State.....

## How to Choose Tough Pump Materials

*(Continued from page 55)*

general guide for the selection of boiler feed pump materials. It goes without saying that is represents an average of the recommendations in use today and is subject to some modifications.

The possible range of selection of corrosion-resistant stainless steels is wide and includes both the straight chromium steels and the so-called austenitic, chromium-nickel steels. In the former type, the chromium content may be at the 5, 9 or 13 per cent level; in the latter case, the composition range may extend from the familiar 18 per cent chromium, 8 per cent nickel type to the higher 25 per cent chromium, 20 per cent nickel type (adopted by the U. S. Navy for all boiler feed pump service). The final selection, in any case, depends both on the details of design and the operating conditions. It is important to remember, however, that the austenitic steels have a coefficient of expansion approaching that of bronze and 50 per cent greater than that of carbon steel or of the lower chromium level steels. If the design of the boiler feed pump is such that this difference in coefficient of expansion may lead to operational difficulties, the use of 18-8 steel or higher chromium content is not recommended.

In part, there exists a certain tendency to select the stainless steel for the pump casing from the point of view of its weldability. While it is true that some stainless steels are more readily welded than others, it is necessary to remember that their use in itself practically eliminates any possibility of the need for field welding. However, even the 5 per cent chromium alloy can be practically welded in the field. It must be heated to approximately 400 F prior to welding, heated to about 1200-1300 F for stress relieving and not permitted to cool quickly and air harden. Similarly, 13 per cent chromium steel should be heated after welding to about 1300 F and 18-8 stainless to 900 F for complete stress relieving. Of course, if the weld is small, stress relieving is not necessary.

## Tools— Their Use and Selection

*(Continued from page 45)*

when filing soft metals, such as lead, aluminum, etc., allow the file to drag lightly over the metal on the reverse stroke in order to help clean the teeth.

Where special filing problems are encountered, it often proves advantageous to employ files specially designed for cutting the particular material being filed. This applies to the filing of rough castings, die castings, aluminum, brass, lead, copper and stainless steel.

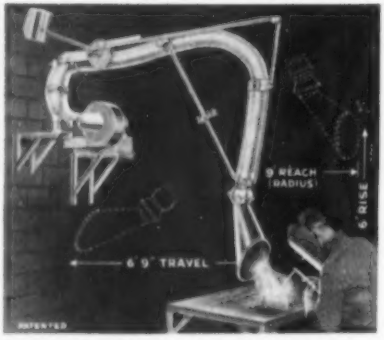
Files are edged tools like knives or chisels and their cutting edges consequently should be protected if the maximum useful life is to be obtained. Never throw a file into a tool box or drawer containing other tools nor lay it on top of another file. Files should be equipped with sturdy secure handles and should be hung by their handles, separate from one another, and in a dry location so that the teeth edges will not rust.

Whenever the spaces between the teeth of a file become choked, brush them clear with a file brush or card. Avoid tapping the file to clear it of clogged material as this may break the teeth.

---

ALUMINUM SHEATHED under-ground, over-head, and submarine cables have been introduced successfully in England and Germany, replacing lead-sheathed cable.

This and other new and contemplated uses of aluminum in the electrical field were reported by H. V. Menking of the Reynolds Metals Company at the Cincinnati meeting of the AIEE recently. He said investigations are being made of the possibility of using aluminum wire and cable without steel support for building wire to replace copper.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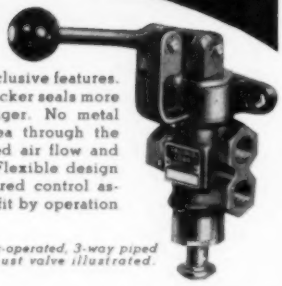

*Lever-operated, 3-way piped exhaust valve illustrated.*

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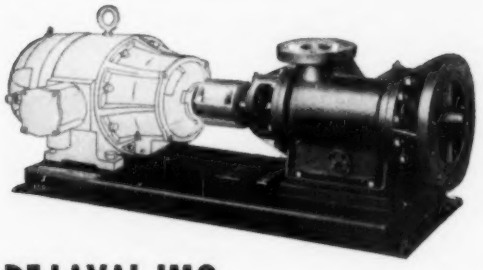

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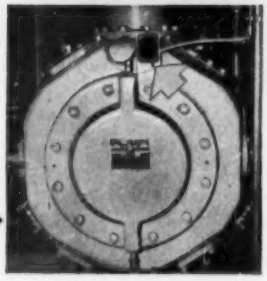

The Engineer at The Harvey Metals Corp. is well pleased with the Sarco TR-21 cooling control on this big compressor in Chicago. And so is the management because up to ⅔ of the metered water used for cooling is now saved. The engineer says: "With several thousand dollars tied up in a compressor, you are going to open up the cooling line wide and play safe, unless you have cooling control. Yes, we use the warm water too, but it used to overflow the hot well continually."

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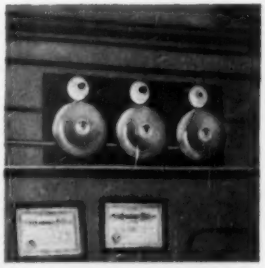

Bell rings and red light flashes when compressor cooling water gets too hot.

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# *New Books for Plant Engineers*

**An asterisk (*) following the title of any book described in this department indicates that the book may be purchased from the Book Department, PLANT ENGINEERING, 53 W. Jackson Blvd., Chicago 4, Ill.**

## Layout Planning for the Three M's*

**LAYOUT PLANNING TECHNIQUE by John R. Immer. Size 6 by 9 in.; 430 pp including index and appendix; cloth bound. Published by McGraw-Hill Book Co. Price $5.00.**

THE THREE M's of production—men, materials and machines—are treated in this text with regard to their layout arrangement in the smooth flow of production. The book tells of the methodology for solving layout problems, a description of layout planning methods and techniques being used successfully at the present time. Examples of layout from many types of manufacturing plants, offices, stores and farms are included to illustrate this wide application.

Some of the subjects handled in the 28 chapters are: assembly-line layout, progressive assembly, continuous flow of production, straight-line production, establishing lines of flow, templets, use of scale models, principles of material handling and selection of MH equipment. A final chapter sets down case studies and their layout solutions.

This book should prove very beneficial to the plant engineer who is concerned with the even flow of materials and the proper location of the machinery.

## Calling All Riggers*

**HANDBOOK OF RIGGING by W. E. Rossnagel. Size 6 by 9 in.; 321 pp including index and appendix; cloth bound. Published by McGraw-Hill Book Co. Price $4.75.**

THE AUTHOR, safety engineer for Consolidated Edison Co. of New York, has prepared this book as a handy reference for daily use of the average workman. It deals plainly and expertly with everyday maintenance operations in industrial plants, factories; in the transportation and handling of heavy machinery; and in the erection and demolition of smaller size structures.

The book is confined to technical phases of rigging and covers everything important from fiber and wire rope, hoisting chains and hooks and testing scaffold planks to painting and repairing steel stacks, strength calculations for timbers and accident prevention.

Included in the book are data on wire-rope installations useful to designers of small portable cranes, high-lift trucks, and modern material-handling equipment. Scores of charts and tables help you to make simple calculations to check loads and strength of equipment.

Maintenance and safety engineers, foremen, crane operators, hoisting engineers, steel erection foremen, riggers, and others will find condensed into this practical handbook the methods essential to more effective rigging practices in construction and industrial operations.

## For the Kinematics—Kinetics-Konscious*

**ENGINEERING MECHANICS by Archie Higdon and William B. Stiles. Arthur W. Davis and Herbert O. Ostrud, collaborators. Size 6 by 9 in.; 505 pp including index and appendix; cloth bound. Published by Prentice-Hall Inc. Price $6.65.**

THIS TEXTBOOK stresses the fundamental principles of engineering mechanics and the development of the ability to apply them. Equal emphasis is placed on statics and dynamics. Wherever possible, an action is illustrated by the use of free body diagrams or other pictorial and semigraphical aids. These supplement, rather than replace, the application of elementary calculus, which is stressed by the authors.

Starting out with basic concepts the book goes into resultants of force systems, centroids and centers of gravity, equilibrium and friction. Other chapters cover second moment or moments of inertia, kinematics of absolute and relative motion, kinetics of force, mass, and acceleration; of work and energy;

*(Continued on page 104)*

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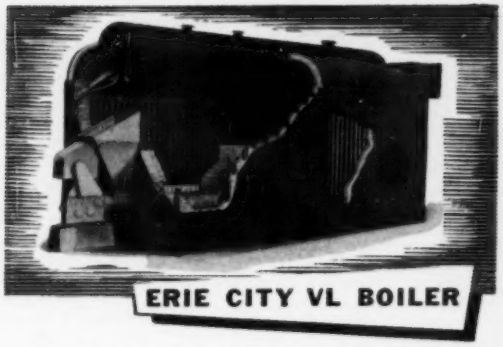

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of impulse and momentum, and a chapter on mechanical vibrations.

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## Standards on Coal and Coke

**A.S.T.M. STANDARDS ON COAL AND COKE prepared by A.S.T.M. Committee D-5. Size 6 by 9 in.; 164 pp including appendices; paper bound. Published by American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pa. Price $2.00.**

THIS OCTOBER 1949 compilation brings together in convenient form all of the A.S.T.M. standards on coal and coke.

Test methods and procedures on coal cover sampling, analysis for volatile matter in connection with smoke ordinances, grindability, drop shatter test, tumbler test, screen analysis, size, sieve analysis, cubic foot weight, index of dustiness and free-swelling. Specifications cover classification of coals by rank and grade.

For coke there are standardized methods for sampling, and tests for volume of cell space, drop shatter, tumbler, sieve analysis, cubic foot weight, and index of dustiness.

Appendices give proposed methods covering: expansion pressure of coal during coking; carbonization pressure of bituminous coal; measurement of pressures developed during carbonization of coal by the movable wall oven; and test for agglutinating value of coal.

## ECPD Seventeenth Annual Report

THE SEVENTEETH Annual Report of the Engineers' Council for Professional Development gives an encouraging across-the-board picture of what the Engineering Profession is doing to improve the competence of its members and to make engineering work more rewarding in personal satisfactions. For this reason the 47-page recently published document deserves a careful reading by all engineers who are interested in the betterment of the profession. A copy may be obtained for 50 cents from the Council, 29 W. 39th St., New York.

## Packaging Production, Cost and Reduction

**Packaging Bulletins. Size 6 by 9 in. Published by the American Management Assn., 330 W. 42nd St., New York 18, N. Y. Price: 75¢.**

PACKAGING Series No. 30, Improving the Efficiency of Packaging Production, 40 pp, consisting of five papers and their related discussion presented at the conference held in New Jersey, May, 1949.

PACKAGING Series No. 31, Cost Reduction in Materials Handling and Shipping, 50 pp, consisting of three papers and a panel session presented at the conference held in New Jersey in May of last year. Price of this bulletin: $1.00.

## Data on the Magic Metal

**THE STORY OF MAGNESIUM by W. H. Gross. Size 5 by 8 in.; 258 pp; cloth bound; 1949. Published by the American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio. Price, $2.00.**

WORLD WAR II emphasized the importance of magnesium as one of the basic industrial metals. This book covers the story of its development, use and production and properties in a very readable style. It is intended for the layman rather than the technician but is by no means a popular book. It deals with the economic factors involved, the properties of magnesium and its typical use in many different ways in industry. The book might be called a non-technical manual on the production, utilization and properties of magnesium.

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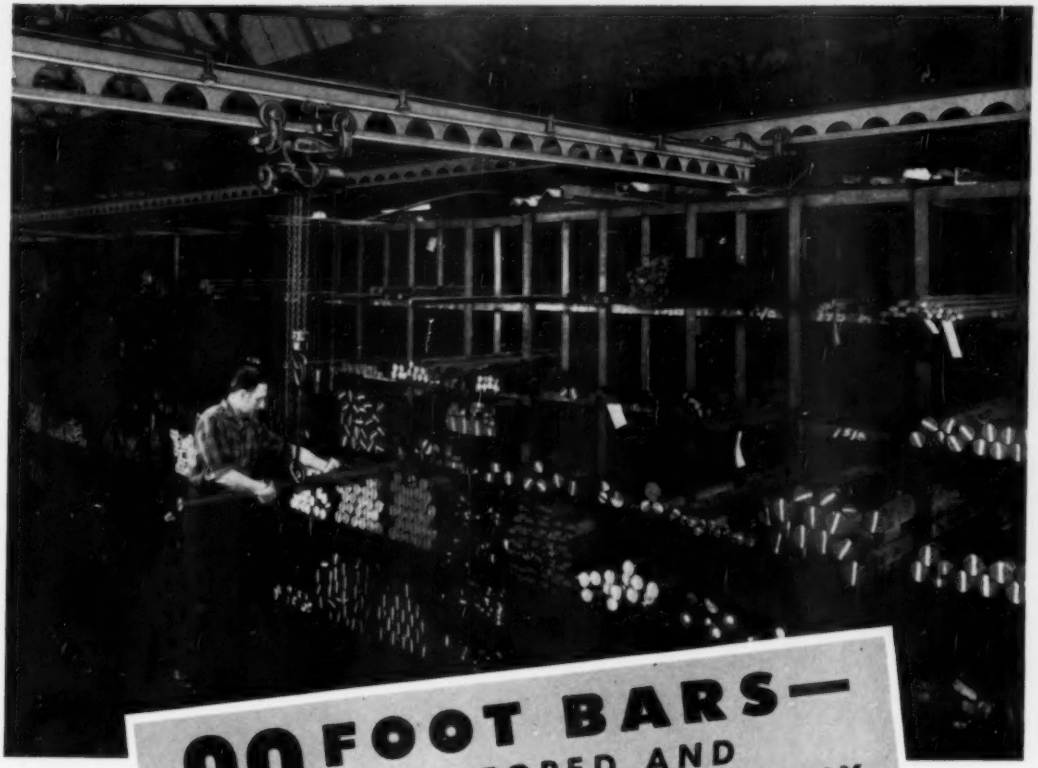

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